The utilization of coconut waste fermented by *aspergillus niger* and *saccharomyces cerevisiae* on meat quality of weaning males rex rabbit

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**Abstract.** Coconut waste (CW) could be applied for animal feed while its nutrition quality were low. This study aims to investigate fermented CW effect on meat quality of Rex rabbit which feed by fermented CW either by Aspergillus niger or Tape Yeast. This research was conducted in rabbit farm Brastagi, using 24 male Rex rabbits with initial weight 1012 ± 126.67 gram in July-October 2016. The design used was complete randomized design : 6 treatment 4 replications. Treatment were T1 (unfermented 10%); T2 (unfermented 20%); T3 (a.niger fermentation 10%); T4 (a niger fermentation 20%); T5 (tape yeast fermentation 10%) and T6 (tape yeast fermentation 20%). The parameters were pH, meat texture either raw or cooked, water content, fat content, protein content of meat and cooking loss. The results showed that effect of treatment was not significantly different (P>0.05) on pH and raw meat texture, but significantly different (P<0.05) on texture of meat cooked and meat fat content and very significantly different effect ( P> 0.01) on cooking loss, water content and protein content of meat. The conclusion of this research was the utilization of fermented CW by *Aspergillus niger* and Tape Yeast improved the quality of Rex rabbit meat

1. Introduction

Coconut waste is usually only discharged to environment. Ginting [1] mentioned that as organic waste, it will decay and cause environmental problem include green housegases emission. Many coconut waste are found in markets where coconut dissolves, or in coconut processed industries. Coconut waste still has a fairly high nutritional value and need to be processed, i.e fermented first in order to increase its nutritional value. The results of analysis conducted by Miskiyah et al. [2] showed that an increased of protein content of coconut waste after fermentation from 11.35% to 26.09% or by 130% and decrease of fat content by 11.39%. Dry matter digestibility and organic matter increased from 78.99% and 98.19% to 95.1% and 98.82%, respectively. Usage in rations typically reaches 20% of the total ration feed ingredients of rabbits.

Low source of animal protein needs, especially meat is the causes of low consumption of animal protein in Indonesia. An alternative source of new animal protein with good, affordable and easy-to-obtain nutritional quality is needed to increase the consumption of animal protein in Indonesian. Rex rabbit, known as the fur-producing rabbit, also has the potential to produce meat, is one of the livestock sources of animal protein.
Meat is the main product of raising livestock. The availability of both quantity and quality of food is one factor that can affect the quality of meat, while other important factors are breed and maintenance management. Feed is very diverse can be a fresh forage, grain, or agricultural waste / industrial waste can affect the quality of meat. According to Kandeepan et al.,[3] the quality of feed can affect the quality of meat, which can affect the dressing yield, the comparison of bone meat, the ratio of fat protein, fatty acid composition, caloric value, color, physico-chemical, shelf life and sensory properties.

Fermented food is as a result of the activities of several types of microorganisms, including bacteria, yeasts, and molds. Microorganisms that ferment food can produce beneficial changes (fermentation products desired) and adverse changes (damage to foodstuffs). Of the food-fermenting microorganisms, the most important are lactic acid-forming bacteria, acetic acid, and some types of alcohol-producing yeasts Suprihatin [4].

Aspergillus niger is a member of the genus Arpergillus, the Eurotiaceae family, the order Entiales, subclass Plectomycetetidae, ascomycetes class, ascomycotina subdivision and amastigmycota division. Aspergillus niger in its growth is directly related to the food substances contained in the medium. Aspergillus niger produces several extracellular enzymes such as amylase, amylglucosidase, pectinase, cellulase, catalase and glucosidase Hardjo et al., [5]. Lehninger [6] added that Aspergillus niger produced urease enzymes that break urea into amino acids and CO₂ which are then used to form amino acid.

Saccharomyces Cerevisiae (Yeast) is a facultative organism that has the ability to produce energy from organic compounds in aerobic or anaerobic conditions so that yeast can grow under different ecological conditions Winarno [7].

2. Material and Methods
This research was conducted at Jl. Air Gg. Rukun (Ranch Rabbit Rukun Farm) Berastagi and Food Technology Laboratory Faculty of Agriculture University of North Sumatra. This study will last for 3 months starting from July 2016 to October 2016.

The material used were 24 male rex rabbits, ration/pelleting ingredients consisting of fermented coconut waste, palm kernel cake, soybean meal, rice bran, fish meal, mineral mix and salt. Meat of rabbit chest and thigh as chemical test of meat. The experimental design used in this study was experimental using a completely randomized design with 6 treatments and 4 replications. The treatment is as follows:

| Treatment   | Description                                      |
|-------------|--------------------------------------------------|
| P0a         | Ration with 10% coconut waste without fermentation |
| P0b         | Ration with 20% coconut waste without fermentation |
| P1          | Ration with 10% coconut waste fermented by Aspergillus niger |
| P2          | Ration with 20% coconut waste fermented by Aspergillus niger |
| P3          | Ration with 10% coconut waste fermented by Saccharomyces cerevisiae. |
| P4          | Ration with 20% coconut waste fermented by Saccharomyces cerevisiae. |

Parameters were meat pH, cooking loss, tenderness, protein. Analysis on protein, water and fat contents was based on AOAC [8].

2.1. Protein levels (AOAC, 1995)
The sample was weighed as much as 0.2 grams weight into a 30 ml Kjeldahl tube, then added 2 grams of K₂SO₄, 50 mg HgO and 2 ml of concentrated H₂SO₄. Samples boiled until clear. After that the liquid is cooled with water flowing slowly. The contents of the flask were then transferred to a distillation apparatus, added 8-10 ml of NaOH-Na₂S₂O₃ and then distilled. The distillate is accommodated in a 125 ml Erlenmeyer containing 5 ml of H₃BO₃ solution and 2 drops of indicator (mixture of red methyl and red blue) to about 15 ml of distillation. The distillation is diluted to about 50 ml and titrated with 0.02 N HCl until the gray color change.
2.2. Water levels (AOAC 1995)
A sample of 2 grams is fed into a known aluminum cup. Then dried in a 100-105 °C oven to constant weight. After that it is cooled in the desiccator and weighed. Water content is obtained by using the formula:
\[
\text{Content water} (\%) = \frac{\text{initial weight} - \text{final weight}}{\text{initial weight}} \times 100\%
\]  

(1)

2.3. Fat Level (Soxhlet Extraction Method) (AOAC 1995)
A total of 5 grams of stapled samples were wrapped in filter paper, loaded into soxhlet, and hexane added sufficiently and refluxed for 5-6 hours. Then, fat gourds containing extraction fat and solvent were heated at an oven at 105 ° C after it was cooled in a desiccot and weighed. Fat content is obtained by using the formula:
\[
\text{Fat content} (\%) = \frac{\text{fat weight (g)}}{\text{sample weight (g)}} \times 100\%
\]  

(2)

3. Results and Discussion
Table 1. Recapitulation of research results of utilization of coconut fermented coconut flour on the quality of rabbit rex meat of male off weaning

| Treatment | pH   | Cooking Loss (%) | Tenderness (mm/g/dt) | Protein content (%) | Water content (%) | Fat content (%) |
|-----------|------|------------------|----------------------|---------------------|------------------|----------------|
| P0A       | 6.096 | 38.812<sup>A</sup> | 0.674<sup>b</sup>   | 13.615<sup>C</sup>  | 70.716<sup>D</sup> | 18.798<sup>a</sup> |
| P0B       | 6.262 | 36.343<sup>C</sup> | 0.946<sup>a</sup>   | 11.307<sup>D</sup>  | 75.748<sup>C</sup> | 18.479<sup>a</sup> |
| P1        | 6.263 | 35.684<sup>C</sup> | 0.715<sup>b</sup>   | 14.592<sup>BC</sup> | 79.721<sup>AB</sup> | 18.149<sup>a</sup> |
| P2        | 6.184 | 33.527<sup>D</sup> | 0.955<sup>a</sup>   | 17.243<sup>A</sup>  | 80.464<sup>A</sup> | 16.034<sup>b</sup> |
| P3        | 6.160 | 37.595<sup>AB</sup>| 0.733<sup>b</sup>   | 13.975<sup>BC</sup> | 76.719<sup>C</sup> | 18.642<sup>a</sup> |
| P4        | 6.084 | 38.784<sup>BC</sup>| 0.584<sup>b</sup>   | 15.193<sup>B</sup>  | 77.792<sup>BC</sup> | 17.472<sup>ab</sup> |

Description: Superscript with different capital letters in the same column shows a very significant different effect (P <0.01).

3.1. pH
According to Lawrie [9]. pH value of meat needs to be known because the pH of the meat will determine the growth and development of bacteria. Virtually all bacteria grow optimally at a pH of about 7 and will not grow exactly below pH 4 or above 7. but the pH for optimal growth is determined by stimulant work of various other variables beyond the acidity factor itself. From the results of this study. pH value of rex rabbit meat showed that meat was feasible to be consumed and good quality because it showed pH value below 7.0 and not contaminated with bacteria with the largest meat pH ultimate is 6.1.

3.2. Cooking Loss
The result of variance analysis in this study showed that the use of coconut waste fermented in the ration gave a very significant different effect (P <0.01) on cooking loss of male rex rabbit meat. This related with nutrition contents of coconut waste after fermentation which improved thus improved meat quality. According to Warriss less cooking loss on meat means that meat has better quality than meat that has more cooking loss due to loss of nutrients during cooking loss. As the result, it also
related with better meat taste or juiciness. Based on the results of this study, the lowest cooking loss of rabbit meat was found in the P2 treatment of 33.527 ± 0.79934 which means that meat with this treatment has the best quality in terms of nutritional content.

3.3. Tenderness

Analysis of rabbit meat texture variance during the study showed very different significant effect (P <0.01) on meat tenderness. This is in accordance with the statement of Soeparno [10] which stated that antetorem factors affecting meat tenderness were species, physiological, age, management, gender and stress.

The mean value of tenderness in this study showed that the highest average was in treatment P2, while the lowest was in treatment P4. This means that the value of meat texture in P2 treatment is better than in treatment P4. This occurred because the collagen levels present in P2 was higher than P4. The texture of meat is also influenced by the protein content of collagen in the meat. Collagen is the main protein in the connective tissue, where the connective tissue is present in almost every component of the body. Collagen connective tissue has an important role on the quality of meat, especially on the tenderness of meat. This is in accordance with the statement Soeparno [10] which states that the meat tenderness also influenced by the protein content of collagen in the meat. This is also in accordance with Reny’s [11] statement which states that factors affecting meat tenderness have something to do with the composition of the meat itself, which is in the form of woven binding, meat fibers, fat cells that exist between the fibers of meat.

This was consistent with the statement of Aberle et al. [12] which states that the regulation of rations for livestock directly affects the variation in the nature of the tendon after the fattening and the fattened cattle in the cage will produce more tender meat than the grazing animals. Bouton et al. [13] stated that age under certain conditions does not affect the tenderness of meat produced. Older cattle but getting ration with good nutrition and handling can produce more tender meat compared to meat produced from young cattle but get ration nutrients and poor handling. Muscles can grow and develop well if they get good nutrition and handling. A good muscle has a smaller amount of collagen per unit area of muscle compared to the muscles of the livestock that get the nutrients and the poor handling, so that the meat will be more tender.

3.4. Protein levels

The results of this study indicated that the provision of coconut waste fermented has very significant different effect (P <0.01) on protein content of rabbit meat. The highest level of meat protein (17.243%) was found in the treatment of P2 while the lowest protein content (11.307%) was found in the treatment of P0B. This means that the type of fermentator and levels in the feed both have a very real effect (P <0.01) on the protein content of meat.

The difference in protein levels was due to differences in levels in the feed ingredients. In addition, levels of fat and water content also affect protein levels in meat. In the results of this study, the fat content of meat in the treatment of P2 was the lowest, causing the meat has a high protein content. The content of fat and water content has a relationship that is inversely related to the protein content in the meat. This is in accordance with the statement Soeparno [10], which stated that the chemical composition of meat is strongly influenced by the fat content. Increasing the fat content of meat and water content causes the protein content will decrease.

3.5. Water content

The results of this study showed that coconut waste fermented very significantly different (P <0.01) to the moisture content of rex rabbit meat weaning. The highest water content of meat was found in P2 treatment (80.464%) while the lowest water content was found in P0A treatment (70.716%). This means that the type and content of fermentor both have very significant different effect on the water content of meat (P <0.01).
The average water content of rabbit meat in this study was still within the normal range (70-80%). in accordance with Lawrie's [14] statement which stated that generally the water content of meat ranges from 68 to 80%. The difference of water content of meat between treatments in this study was influenced by the fat content of the meat. this was because the high fat accumulation rate can loosen the bonding of the structure of the meat network so that much water is liberated. In this research, it was found that the fat content of meat in the treatment of P0A. P3. P0B. P1 and P4 was significantly different (P <0.05) to P2 treatment. so that water content in treatment P0A. P3. P0B. P1 and P4 tended to be higher compared to meat in treatment P2. This result is in accordance with Soeparno's [10] statement, which stated that the fat content has a negative relationship with moisture content. If the fat content of the meat increases the increase in the weight of life then the water content will decrease. so the increase in age will increase the fat content.

3.6. Meat Fat Level
The results of this study indicated that the provision of coconu waste fermented has a significantly different effect (P <0.05) on the fat content of rex rabbit meat. Based on the data in Table 1 it can be seen that the highest content of fatty meat found in P0A treatment was equal to 18.798%. while the average fat content of the lowest meat found in P2 treatment is 16.034%.

Fat levels are influenced by the nation. age. species. location of muscles and feed. Rex rabbits that consume P0A pellet rations have higher levels of fat than rex rabbits that consume P2 rations. This was thought to occur because the feed on the treatment of P0A does not undergo fermentation so that it still has high levels of fat and coarse fiber and on feed treatment P2 has fermentation which causes the decrease in fat content and crude fiber in the feed ingredients. It was also suspected because the fermentation treatment feed done can increase the value of feed TDN. Differences in fat content are also suspected because the water content of rabbit meat treated P0A was lower than rabbit meat in P2 treatment. which causes fat content of P0A meat higher than fat content of meat in treatment P2. This was consistent with the statement by Browning et al. [15] which stated that the high level of fatty meat accumulation can loosen the bonding of meat tissue structures so that much water is liberated. therefore meat containing high levels of fat tends to contain low water content.

4. Conclusion
Coconut waste can be used as rabbit feed material. especially when processing by fermentation that can increase the content of waste nutrients as feed ingredients ration rabbit. Coconut waste fermented by Aspergillus niger at level 20% in pellet ration gives positive effect that can improve the quality of rabbit rex meat. especially in cooking loss. increase of protein content and water content. and decrease of fat content.

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