EFFECT OF LIQUID Saccharomyces cerevisiae ADDITION IN FEED ON THE QUALITY OF BROILER MEAT

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ABSTRACT

The aim of this research was to determine the effect of liquid Saccharomyces cerevisiae addition in feed on physical quality and cholesterol of broiler meat. Materials were used 100 birds 8-days old strain Lohmann broiler unsexed with average body weight 122.6 g/bird ± 10.73 gram with coefficient of variance 8.76 %. The method was experimental within 5 treatments and 4 replications. The feed treatment consisted of T0: basal feed (control), T1: basal feed + liquid Saccharomyces cerevisiae 0.2% (v/w), T2: basal feed + liquid Saccharomyces cerevisiae 0.4% (v/w), T3: basal feed + liquid Saccharomyces cerevisiae 0.6% (v/w), T4: basal feed + liquid Saccharomyces cerevisiae 0.8% (v/w). The variables that measured were color, tenderness, water holding capacity, cooking loss, and cholesterol of breast meat. Data were analyzed by using one-way ANOVAs based on Completely Randomized Design, if there was a significant effect between the treatments then tested with Duncan’s Multiple Range Test. The research result showed that the addition of liquid Saccharomyces cerevisiae in feed give significantly effect (P < 0.01) on cholesterol and it doesn’t give significantly effect (P > 0.05) on color, tenderness, water holding capacity, and cooking loss. It can be concluded that addition 0.8% (v/w) of liquid Saccharomyces cerevisiae showed best results due to decreasing cholesterol and give the standard value of color, tenderness, water holding capacity, and cooking loss of broiler breast meat.

Keywords: liquid Saccharomyces cerevisiae, meat physical quality, cholesterol, broiler

INTRODUCTION

Poultry industry in Indonesia has been developed fastly. Data from BPS (2014) noted that population of broiler from 2000 until 2014 have been increase fastly. It was showed the population in 2000 was 530,874,000 birds become 1,481,872,000 birds in 2014. The poultry industry increasing the feed efficiency by using antibiotic to solving this situation, due to feed cost spent 60-70% of production cost. Antibiotic is chemical substance that resulted by microorganism such as yeast and capable to blocked pathogen microorganism in the livestock’s body. The major function of antibiotic were growth promoters and prevent infectious disease. Salama, et al. (2008) stated that using antibiotic for broiler can result chemical residues that accumulated in the meat and became a danger for human healthy due to causing allergic, disturbance of reproduction system, liver, and chemical residue that accumulated in the meat will causing carcinogenic and raising bacterial resistant that danger for human healthy and environment (Yurdakul, Erginkaya, and Unal, 2013).

The alternative as substitute of antibiotic was needed for production and produce safety meat. Saccharomyces cerevisiae is one kind of biotechnological feed product that has special capability in the gastrointestinal tract and belong one of a kind of probiotic. Probiotic is a beneficial microorganism that given to the livestock
and has positive effect for the performance production and the product quality of th host animal or human. *Saccharomyces cerevisiae* was content of protein, vitamin and producing enzyme that directly help digestion system and nutrient absorption (Santin, et al., 2001), the cell wall content of beta glucan and oligosaccharide to increasing the immunity system, and content of organic acid that can decrease cholesterol (Wahyono, 2002). It is possible for *Saccharomyces cerevisiae* to substitute the function of antibiotic by improve digestion system and nutrient absorption for growth promoters, increasing nutrient absorption, and resulting the safety meat for consumer. There was an idea to using liquid probiotic *Saccharomyces cerevisiae* in broiler feed to determine the effect for improve the physical quality of meat include color, tenderness, water holding capacity, cooking loss, and decreasing cholesterol of broiler breast meat, so can resulted healthy meat.

**MATERIALS AND METHOD**

This research used one hundred birds of 8-days old chicken (DOC) unsexed, then reared 35 days. The average body weight at 8 days of age was 122.6 ± 10.73 g/bird with coefficient of variant 8.76 %. This research used 20 unit plots with size length x width x height =1x1x1 meter of each. Each plot consist of 5 birds with rice husk as the litter as high as 5 cm. Feed treatment arranged by maintenance periods with basal feed for starter (1-21 days) and finisher (22-35 days). Basal feed consisted of corn, soybean meal, rice bran, meat bone meal, corn gluten meal, oyster shells, palm oil, salt, and premix. Feed treatment arranged by the addition of liquid probiotic *Saccharomyces cerevisiae* with different level on each feed and given at the age of 8 days. Composition and basal feed content used in this study are presented in Table 1. Feed and water was given ad libitum and the total plate count (TPC) of liquid probiotic *Saccharomyces cerevisiae* was $1.3 \times 10^6$ CFU/ml.

<table>
<thead>
<tr>
<th>Feedstuff</th>
<th>Starter</th>
<th>Finisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow corn</td>
<td>60%</td>
<td>56%</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>26.88%</td>
<td>23.10%</td>
</tr>
<tr>
<td>Rice bran</td>
<td>-</td>
<td>8.6%</td>
</tr>
<tr>
<td>Meat Bone Meal</td>
<td>6.72%</td>
<td>5.77%</td>
</tr>
<tr>
<td>Corn Gluten Meal</td>
<td>2.88%</td>
<td>2.48%</td>
</tr>
<tr>
<td>Palm Oil</td>
<td>1.60%</td>
<td>2.40%</td>
</tr>
<tr>
<td>Oyster shell</td>
<td>0.77%</td>
<td>0.66%</td>
</tr>
<tr>
<td>Salt</td>
<td>0.19%</td>
<td>0.17%</td>
</tr>
<tr>
<td>Premix</td>
<td>0.96%</td>
<td>0.82%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Metabolizable Energy (Kcal/kg)</td>
<td>2907.80</td>
<td>2975.40</td>
</tr>
<tr>
<td>Crude Protein (%)</td>
<td>21.29</td>
<td>19.47</td>
</tr>
<tr>
<td>Crude Fat (%)</td>
<td>5.86</td>
<td>6.85</td>
</tr>
<tr>
<td>Crude Fiber (%)</td>
<td>3.12</td>
<td>3.41</td>
</tr>
<tr>
<td>Ca (%)</td>
<td>0.97</td>
<td>0.84</td>
</tr>
<tr>
<td>P (%)</td>
<td>0.54</td>
<td>0.48</td>
</tr>
</tbody>
</table>

Notes: Analysis Result of Feed and Animal Nutrition Laboratory, Faculty of Animal Husbandry, University of Brawijaya.
Method was used feed experiment by Completely Randomized Design consist of 5 treatments and 4 replications, each replication used 5 birds. The treatment were using basal feed with different level of liquid Saccharomyces cerevisiae. The treatment feed given as follow:

T0: Basal feed + liquid Saccharomyces cerevisiae level 0% (v/w)
T1: Basal feed + liquid Saccharomyces cerevisiae level 0.2% (v/w)
T2: Basal feed + liquid Saccharomyces cerevisiae level 0.4% (v/w)
T3: Basal feed + liquid Saccharomyces cerevisiae level 0.6% (v/w)
T4: Basal feed + liquid Saccharomyces cerevisiae level 0.8% (v/w).

The variables include brightness color (L*,a*, b*), tenderness (N), cooking loss (%), water holding capacity (%), and cholesterol of broiler breast meat (mg/100g). Data were analyzed using one-way ANOVAs based on Completely Randomized Design, if there was significant effect then continued with Duncan Multiple Range Test.

RESULTS AND DISCUSSIONS

The research result by addition of liquid probiotic Saccharomyces cerevisiae in feed on the quality of broiler meat completely can be seen in Table 2.

### 4.1 Effect of Treatment on Color Meat

Result of the analysis showed that treatments by liquid Saccharomyces cerevisiae addition in feed give no significantly effect (P>0.05) on the color include brightness color (L*), redness (a*), and yellowness (b*). The highest average value of brightness color were treatment T4 (38.77 ± 2.59), the highest average of redness value were treatment T4 (12.25 ± 0.81), and the highest average of yellowness were treatment T2 (10.72 ± 2.22). The differentiation of the results caused by the pigmentation of meat color.

Table 2. Effect of Liquid Saccharomyces cerevisiae Addition in Feed on The Physical Quality and Cholesterol Content of Broiler Meat

<table>
<thead>
<tr>
<th>Variables</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T0</td>
</tr>
<tr>
<td>Color:</td>
<td></td>
</tr>
<tr>
<td>L*</td>
<td>36.25 ± 2.50</td>
</tr>
<tr>
<td>a*</td>
<td>11.27 ± 0.49</td>
</tr>
<tr>
<td>b*</td>
<td>8.32 ± 0.98</td>
</tr>
<tr>
<td>Tenderness (N)</td>
<td>13.32 ± 2.91</td>
</tr>
<tr>
<td>Water Holding Capacity (%)</td>
<td>38.10 ± 3.27</td>
</tr>
<tr>
<td>Cooking Loss (%)</td>
<td>25.68 ± 2.25</td>
</tr>
<tr>
<td>Cholesterol (mg/100g)</td>
<td>82.71 ± 0.18&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Notes: L*): brightness meat color, a*): redness color, b*): yellowness color
Different superscript in the same row indicate significant effect (P <0.01)
Soeparno (2005) stated that the redness of meat affected by pigments. Meat pigment is made up of two proteins, namely myoglobin pigment in the muscle and hemoglobin in the blood. The origin of the resulting pigment, is influenced by several factors including the species, age, gender, livestock stress (muscle type and activity level), pH, oxygen, and feed. Composition of corn that used for starter feed was 60% and finisher 56%. Corn has xanthophylls as the yellow pigment that will be affected the yellow color of the meat. Corn presentation was give in the same proportion for all treatment, so not give significant effect for the meat color. Nurfajarwati (2006) also stated that pigment of Saccharomyces cerevisiae is white transparent yellowish with polysaccharide 80-90% and most consist of beta glucan and mannan, then small portion of citin in the cell wall. So, the treatment doesn’t give significantly effect on meat color. pH standard for meat was 5.96 – 6.07 (Van lack, 2000) or 5.4 – 5.8 (Soeparno, 2005). Based on the results, give better value than control on treatment T4 (0.8%). It was due to Saccharomyces cerevisiae can increasing the ultimate pH so after slaughtered the decreasing pH can not occured rapidly and prevent meat become PSE (pale, soft, and exudatifle) by as therapeutic agent to lowering the stress condition. Karaoglu, et al., (2004) and Aksu, et al., (2005) stated broiler was given probiotic in the feed resulting the increasing of the ultimate pH.

4.2 Effect of Treatment on Tenderness

Result of the analysis showed that treatments does not give significantly effect (P>0.05) on tenderness. The highest average value of tenderness were treatments T1 (14.57 ± 1.84), T2 (14.55 ± 2.98), T3 (14.07 ± 2.43), T0 (13.32 ± 2.91), and T4 (12.87 ± 2.48), respectively. The lowest value showed the higher tenderness, due to just needed smaller pressure (Newton) for pressing the meat. The result research showed that the addition of 0.8% (ml/g) liquid Saccharomyces cerevisiae can increasing the meat tenderness in T4 (12.87 ± 2.48). Soeparno (2005) and Maruddin (2004) stated that smaller value of tenderness showed that meat more tender, and the higher value of tenderness showed that meat more tough.

Soeparno (2005) stated that the main components of meat which influenced the tenderness were the connective tissue, muscle fibers, and adipose. Smaller connective tissue than muscle tissue will produce more tender meat and the higher of marbling will make the meat more tender. The content of Saccharomyces cerevisiae in feed also influenced it due to composed by protein 50-52%, carbohydrates; 30-37%, fat 4-5%, and minerals 7-8% (Ahmad, 2005). Saccharomyces cerevisiae also can produce enzyme protease to increasing the digestion and convert protein to be amino acid and causing meat more tender. As mentioned by Soeparno (2005) that the increasing protein level in feed and in meat can be stimulator to causing the rapid fat formation. Hoffman, et al., (2003) stated that meat tenderness is also linked to the value of pH, water holding capacity, and cooking loss. pH value of the meat have a negative relationship with the value of tenderness. The higher pH value will causing the meat more tender.

4.3 Effect of Treatment on Water Holding Capacity (WHC)

Result of the analysis showed that treatments give no significantly effect (P>0.05) on water holding capacity of breast meat. The highest average value of WHC were treatments T4 (45.03 ± 4.15), T3 (44.12 ± 4.24), T2 (41.80 ± 0.67), T1 (40.86 ± 2.59), and T0 (38.10 ± 3.27), respectively. The result showed that the increasing of WHC have positive effect with increasing the level of Saccharomyces cerevisiae although give no significant effect. Kartikasari (2000) stated that the range of
value of normal water holding capacity was 22.40-25.96% and Soeparno (2005) stated that the normal value of it was 22.19-28.54%. In this result showed that the value of water holding capacity was higher than literature due to the used and absorption of fat and protein for each livestock is different. Water holding capacity affected by protein content, pH in the meat and feed.

Water holding capacity has positive correlation with protein content. This is accordance to Soeparno (2005) that free molecule of water had amount of 10% binded among protein molecule, that will decrease if occurred protein denaturation in the meat. Oktaviana (2009) also explained that increasing the protein content in meat will affected to increasing the water holding capacity due to increasing the capability of protein to binding the water. Water holding capacity also affected by pH of meat (Alvarado and McKee, 2007), the water was stuck in the muscle was increased in line with the rise in pH, although with small ascension (Bouton, et al., 1978 in Hartono, 2013). Water holding capacity has a positive relationship with the pH value of the meat (Allen, et al., 1998 in Prayitno, 2010). However, WHC has a negative correlation with the tenderness value. The highest WHC resulted at treatment T4 (45.03 ± 4.15) that has the lowest tenderness values at T4 (12.87 ± 2.48). It means that the higher of WHC, the meat will have a lower tenderness value, which indicates that the meat more tender. These results were in accordance with the statement of Soeparno (2005) that the increased of ultimate pH in the meat, generally able to increase the water holding capacity and causes the meat more tender.

### 4.4 Effect of Treatment on Cooking Loss (CL)

Result of the analysis showed that treatments by liquid *Saccharomyces cerevisiae* addition in the feed give no significantly effect (P>0.05) on cooking loss of breast meat. The highest average of cooking loss presentation were treatment T2 (27.21 ± 1.09), T4 (26.75 ± 1.70), T3 (25.78 ± 1.80), T0 (25.68 ± 2.25), and T1 (24.79 ± 2.09), respectively. The research result showed that the best treatment in T1 (24.79 ± 2.09). Soeparno (2005) stated cooking loss value of broiler meat was about 24.89% - 34.57%. The insignificant result and not stable caused by some factor such as feed consumption, pH, water holding capacity, length of cooking, and temperature of cooking. The good quality of meat have lower value of cooking loss (Lawrie, 2003; Soeparno, 2005; Dilaga and Soeparno, 2007) due to lossing small nutrient during cooking and feed consumption also affecting it. Cooking loss have a negative effect with WHC. The research result showed that the highest treatment T4 (45.03 ± 4.15) with lower cooking loss (26.75 ± 1.70). These results are in accordance with the statement of Bouton, et al. (1978) in Hartono (2013) that the lower of WHC can be causing higher CL. Cooking loss also affected by ripening time and temperature. The higher of temperature and the cooking time resulted higher value of CL in the broiler meat (Yu, et al.,2005).

### 4.5 Effect of Treatment on Cholesterol of Breast Meat

Result of the analysis showed that treatments give significantly effect (P<0.01) on cholesterol content of breast meat. The highest average value of cholesterol were treatment T0 (82.71 ± 0.185), T1 (81.72 ± 0.155), T2 (78.17 ± 0.57b), T3 (74.62 ± 0.60b), and T4 (73.97 ± 0.49b), respectively. The result showed the best result in treatment T4 (73.97 ± 0.49b), due to have lower value of cholesterol that means good for consumed. The decreasing of cholesterol content is in line with the increasing of probiotic presentation that used (0.8% ml/g). The lowest result in T4 (73.97 ± 0.49b) with addition *Saccharomyces cerevisiae* as much
as 0.8% (ml/g). These results make it clear that with the addition of *Saccharomyces cerevisiae* can decreasing cholesterol content of broiler breast meat. Saidin (2010) stated that the cholesterol content of broiler breast meat was 110 mg/100 g.

Wahyono (2002) stated that probiotics produced anti cholesterol substances and absorbs a number of cholesterol into its cell. Probiotic also produced organic acids in blood vessels, such as folic acid, ascorbic acid, and colat acid that affecting occurrence of dissociation of the LDL (low density of lipoprotein) or cholesterol harmful. Sukada (2006) stated that the use of probiotic in the feed can preventing the enzyme activity of 3-hydroxy-3-methylglutaryl-Co A reductase which works for synthesize cholesterol in the liver. Probiotics affect the activity of enzymes such as bile salt hydrolase, and as a result, was able to lower the cholesterol levels. Fuller (1992) stated that probiotics can also maintain the homeostatis system that allowing the occurrence of destruction or degradation mechanism of cholesterol by microorganisms in the intestine into colat bile acids. And the excessive of cholesterol would be excreted together by fesses in the form of bile salt and neutral steroid hormone.

**CONCLUSION AND RECOMMENDATION**

The addition of liquid *Saccharomyces cerevisiae* as much as 0.8% (ml/g) give the best results due to decrease cholesterol and give the standard value on color, tenderness, water holding capacity, and cooking loss. Based on the research results, it was recommended to add the liquid *Saccharomyces cerevisiae* 0.8% (ml/g) and observe the viability of *Saccharomyces cerevisiae* in broiler feed.

**REFERENCES**


