EFFECTIVENESS OF KUPANG SEA FLOUR GIVING AS ADDITIONAL FEED ON THE PRODUCTIVITY OF FREE-RANGE CHICKENS IN INCREASING FARMER INCOME

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ABSTRACT

Local chicken is one of the Indonesia native chickens that potential to be developed. It could be found in all the provinces from the city to the rural area though have the various weather and climate condition. Feed as one of the three main factors in animal field affect the improvement of animal production in fulfilling the animal protein needs of human. One of the alternatives to eliminate feed cost is utilizing local resources as protein sources for animal by using sea remis flour. This study aimed to understand the effectivity of sea remis flour addition on local chicken productivity. Research method used was completely randomized design consists of 4 treatments and 5 replications by using 40 laying phase local chickens raised intensively for 32 days in battery cages filled 2 chickens per cage unit. Treatment rations were concentrate substitution toward 0% of sea remis flour (R0), concentrate substitution toward 1.5 % of sea remis flour (R1), concentrate substitution toward 3% of sea remis flour (R2), concentrate substitution toward 4.5% of sea remis flour (R3). Based on result of the study, it could be stated that addition of 3% of sea remis flour in ration affect feed consumption, egg production, feed conversion, and egg weight.

Key words: Egg, production, consumption, feed conversion, sea remis

INTRODUCTION

Free-range chicken is one of the native Indonesian chickens that have the potential to be developed. The presence of free-range chicken is often found in all provinces to remote even though it has a variety of climate varies. Arabic chicken (Gallus turcicus) comes from partridge and is one of the free-range chickens that have been adapted in Indonesia and can reproduce with low nutritional feed content. Arabian chickens are more profitable compared to native chickens because native chickens are only able to produce 39-130 eggs per year, whereas Arab chickens if cultivated intensively every year, can lay eggs up to 280 eggs (Binawati, 2008).

Feed as one of the constituents of the golden triangle affects the increase in livestock production in meeting the need for animal protein. The composition of feed formulations that have a nutritional balance will produce laying hens to maximum productivity performance. The quality of poultry feed can be seen from its protein content, the higher and more complete the protein, the better the feed.

The type of feed will certainly have a different impact on performance (feed consumption, egg production, feed conversion, and depletion) of free-range
chicken production. Protein is a nutrient that is very important for the animal's body, a protein that is not produced in the animal's body must be given through feed ingredients. Protein source food ingredients that are given must also contain complete and balanced amino acids so that the use of protein is more efficient. Protein-based feed ingredients used as poultry feed are mostly conventional feed such as soybean meal, fish meal, *Meat Bone Meal* (MBM) and *Poultry Meat Meal* (PMM) which have quite expensive prices, so the provision must be appropriate to reduce costs (Nunik et al., 2017). One alternative is to reduce the cost of feed by utilizing local resources as a source of protein for livestock, namely the use of sea mussel flour.

**MATERI DAN METODE**

This research was conducted at the Laboratory of Technology and Animal Production, Department of Animal Husbandry, Faculty of Animal Science, Halu Oleo University, Kendari. The time for implementation starts August 29 - September 28, 2018.

**Theory**

This study used 40 layer free-range hens. The ration used was self-mixing ration and made in the form of pellets composed of yellow corn, fine bran, and laying hens concentrate (RK 24) of PT. Charoen Pokhpand. Sea Kupang as an additional feed that has been formulated with the appropriate concentration of treatment. The cage used is a battery cage, with a length of 40 cm, width 30 cm, and height 37 cm. The tools used in this study are digital scales, feed containers, drinking containers, ovens, grinders, and pellet molds.

<table>
<thead>
<tr>
<th>Feed Ingredients</th>
<th>Metabolisms Energy (Kcal/kg)</th>
<th>Crude Protein (%)</th>
<th>Fiber (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow Corn</td>
<td>3300</td>
<td>10,82</td>
<td>3,37</td>
</tr>
<tr>
<td>Rice Bran</td>
<td>2400</td>
<td>9,80</td>
<td>15,8</td>
</tr>
<tr>
<td>RK 24</td>
<td>2650</td>
<td>36</td>
<td>8</td>
</tr>
<tr>
<td>Sea Clam Flour</td>
<td>10,85</td>
<td></td>
<td>2,68</td>
</tr>
</tbody>
</table>

**Source:**
1: Team of Feed Science and Technology Laboratory
2: Brochure of PT. Charoen Pokhphand Indonesia
3: Subani et al. (1983)

<table>
<thead>
<tr>
<th>Feed Ingredients</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RO</td>
</tr>
<tr>
<td>Yellow corn</td>
<td>50</td>
</tr>
<tr>
<td>Rice bran</td>
<td>15</td>
</tr>
<tr>
<td>RK 24</td>
<td>35</td>
</tr>
<tr>
<td>Sea clams flour</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>
**Metode**

The study was compiled based on a Completely Randomized Design (CRD) using 40 layers of free-range chicken / Arabic chickens that were kept intensively for 32 days divided randomly based on treatment. Each treatment was repeated 5 times so that there were 20 experimental units and each cage unit contained 2 chickens. The treatment ration consisted of 4 types, namely substitution of concentrate on 0% sea shell (R0), the substitution of concentrate on 1.5% sea shell (R1), the substitution of concentrate on 3% sea mussel (R2) and substitution of concentrate on 4.5% mussel sea (R3).

**Feed Consumption**

Daily feed consumption is obtained based on the difference between the amount of feed given less the remaining feed in one day calculated by the equation:

\[
\text{Feed consumption} = \frac{\text{Feed given (gr)} - \text{Leftover Feed (gr)} \times 100}{\text{Number of Chickens (Tails)}}
\]

**Egg Production (HDP)**

*Hen Day Production* (HDP) is a way to calculate daily egg production. The purpose of HDP calculation is to find out the number of eggs produced by a group of chickens at a certain age calculated by the equation:

\[
\text{Egg Production} = \frac{\text{Egg Production (grains)} \times 100}{\text{Number of Chickens (tails)}}
\]

**Feed Conversion**

Feed Conversion Ratio (FCR) or commonly referred to as feed conversion is the ratio between the amount of feed consumed (Feed Intake) with egg products produced in the same period and units calculated by the equation:

\[
\text{Feed Conversion} = \frac{\text{Feed consumption (gr)}}{\text{Egg Weight (Grain)}}
\]

The data obtained were processed using variance according to the Completely Randomized Design (CRD) and if the treatment had a significant effect it was further tested using the Duncan Multiple Regional Test (Gasperz, 1994). The mathematical model of the experimental design follows the following mathematical model:

\[
Y_{ij} = \mu + \tau_i + \epsilon_{ij}
\]

**Information:**

- \(Y_{ij}\) = The observation results from the i-treatment variable and with the replication to-j
- \(\mu\) = Middle value
- \(\tau_i\) = Effect of treatment on-i
- \(\epsilon_{ij}\) = Effect of experimental error from treatment to-i and quiz to-j
- \(i\) = Treatment to 0, 1, 2 dan 3
- \(j\) = Deuteronomy to 1, 2, 3 dan 4

**RESULTS AND DISCUSSION**

**Consumption of Rations**

Feed consumption is the amount of food eaten in a certain period. Feed consumed by livestock is used to meet the needs of energy and other nutrients. The average consumption of native chicken rations with...
the addition of sea mussel flour to rations with different levels can be seen in Table 3.

Table 3. The average consumption of free-range chicken feed for 32 days treated

<table>
<thead>
<tr>
<th>Replications</th>
<th>R0 (0% TKL)</th>
<th>R1 (1.5% TKL)</th>
<th>R2 (3% TKL)</th>
<th>R3 (4.5 TKL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>122.67</td>
<td>121.32</td>
<td>116.15</td>
<td>120.68</td>
</tr>
<tr>
<td>2</td>
<td>122.57</td>
<td>120.12</td>
<td>123.80</td>
<td>123.30</td>
</tr>
<tr>
<td>3</td>
<td>119.22</td>
<td>118.27</td>
<td>112.78</td>
<td>121.48</td>
</tr>
<tr>
<td>4</td>
<td>122.47</td>
<td>117.45</td>
<td>113.35</td>
<td>123.45</td>
</tr>
<tr>
<td>5</td>
<td>125.52</td>
<td>119.02</td>
<td>117.80</td>
<td>125.52</td>
</tr>
<tr>
<td>Average</td>
<td>122.49±2.23b</td>
<td>119.24±1.52ab</td>
<td>116.78±4.43a</td>
<td>122.23±1.89b</td>
</tr>
</tbody>
</table>

Information: a, b (different superscripts in the same row are significantly different) (p<0.05)

TKL (SCF): Sea Clams Flour

Based on the results of the analysis of variance, showed that the addition of sea mussel in the ration was significantly different (P <0.005) to feed consumption. Duncan's test shows that feed consumption in treatment R2 is significantly different than R0 and R3. The addition of sea mussels in the ration with a level of 3% influences feed conversion, which is a decrease when compared to treatments R0 and R3. The decrease in consumption also occurred in the treatment R1, but statistically not significantly different from R0, R2, and R3.

The results of the consumption of Arabic chicken rations in this study were higher when compared with the results of research conducted by Kartasudjana and Suprijatna (2006) which stated that the consumption of adult Arabic chicken rations, over the age of 18 weeks was around 80-100 g/head/day. Likewise with the results of research conducted by Muharlien and Nurgiartiningsih (2015), namely the consumption of Arabic chicken rations fed with flour and papaya leaf juice, ranging from 86.14 - 88.42 g/head/day. While the results of research conducted by Yadi (2013), the consumption of Arabic chicken rations fed with functional feed ranged from 99.72 - 109.34 g/head/day. The difference is influenced by several factors such as age, temperature, chicken weight and the feed factor itself.

Based on observations of consumption of Arabic chickens fed rations with the addition of sea mussels by 3% can reduce the consumption of research chicken rations. Kartasudjana and Suprijatna (2006) explain that chickens consume rations to fulfill their energy. If the energy needs have not been met, causing the chicken will continue to eat. If the energy needs have been met, then the chicken will stop eating or reduce its consumption, besides that if the energy content in the ration is high, the chicken will also reduce its consumption. The efficiency of ration administration is very important to know as a parameter to assess the effectiveness of ration use on the components produced. The efficiency of the ration can also be used to assess the ability of nutrients contained in the ration to determine the basic needs and production of consuming animals. (Yemen, et.al, 2008). Based on this, the addition of sea mussels by 3% in the ration, is more efficient than other treatments because it
reduces the consumption of ration in Arabic chickens.

The protein content in laying hens feed affects the health of chickens, as it was previously known that protein is beneficial for growth, egg production, and energy, but the administration of excess protein will result in weight gain and this causes the chickens to prolapse. Prolapse can occur when the fallopian tubes don't retract after laying eggs, so a balance of feed nutrients and their consumption is needed to prevent this from happening (Fadilah et al., 2012).

**Egg Production**

Daily egg production (Hen day egg production) is one measure of chicken productivity obtained by dividing the number of eggs by the number of chickens at that time (Amrullah, 2003). The average production of native chicken with the addition of sea mussel flour in diets with different levels can be seen in Table 4.

Table 4. Average production of free-range chicken eggs for 32 days treated

<table>
<thead>
<tr>
<th>Replications</th>
<th>Treatments (R)</th>
<th>R0 (0% TKL)</th>
<th>R1 (1.5% TKL)</th>
<th>R2 (3% TKL)</th>
<th>R3 (4.5 TKL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45.31</td>
<td>56.25</td>
<td>73.44</td>
<td>48.44</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>57.81</td>
<td>57.81</td>
<td>73.44</td>
<td>60.94</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>59.38</td>
<td>67.19</td>
<td>65.62</td>
<td>64.06</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>51.56</td>
<td>60.94</td>
<td>71.88</td>
<td>65.62</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>62.50</td>
<td>59.38</td>
<td>60.94</td>
<td>64.06</td>
<td></td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>55.31±6,87</strong></td>
<td><strong>60.31±4,22</strong></td>
<td><strong>69.06±5,57</strong></td>
<td><strong>59.77±7,02</strong></td>
<td></td>
</tr>
</tbody>
</table>

Keterangan : Information: a,b,c different superscripts in the same row are significantly different (p<0,05) TKL (SCF): (Sea Clams Flour)

Based on the results of the analysis of variance, showed that the addition of sea mussel in the ration had a significant effect (P <0.005) on the production of Arabic chicken eggs. Duncan's test shows that the production of Arabic chicken eggs in treatment R2 is significantly different compared to R0, R1, and R3. The addition of sea mussels in the ration with a level of 3% influences the production of Arabic chicken eggs, which is an increase when compared to other treatments, which amounted to 69.06%. Sulandari, et al. (2007) stated that Arabic chicken production was 190-250 eggs /head/year or 52.0% - 68.49%. The same thing was expressed by Binawati (2008), that the ability of Arabic chicken egg production is quite high, namely 200-250 eggs/head /year or 54.79% - 68.49%. As well as the results of a study conducted by Yadi (2013), the production of Arabic chicken eggs that were given functional feed ranged from 56.89% - 69.64%.

The feed is one of the important factors that affect productivity. In addition to basic needs, feed consumed by livestock is also used for growth, production, and reproduction. In preparing the ration it is important to pay attention to the content of feed ingredients. Suprijatna (2005) states that the percentage of production during the period of production is significantly affected by the level of protein during the production period.

Increased egg production by R2 treatment with the addition of sea mussel by 3% increases the protein content of the ration so that it affects the egg production in Arabic chickens. Protein is one of the
substances that are important for animal growth because of protein functions in the formation of body tissues. So that if protein requirements are lacking, chicken growth will be disrupted which will also affect egg production. This increase is in line with the reduction in ration consumption in the treatment R2, this indicates that the addition of sea mussel by 3% can reduce the consumption of rations and can increase egg production so that the use of feed becomes more efficient.

Suthama (2005) states that high and low consumption of protein and energy will affect the number of eggs produced. Besides the condition of poultry health and stress levels in chickens also affect production results. Astuti and Suwiningsih (2010) stated that the determinants of egg productivity were influenced by the nutritional content of the feed, feed consumption, and age. However, the addition of sea mussels at 1.5 and 4.5% did not affect the production of Arabian chicken eggs.

The feed given to laying hens must be as needed, both in terms of quality and quantity so that livestock can be utilized for various bodily functions, namely basic life, and egg production. This is following the opinion of Bird et al. (2003) which states that the decrease in body weight caused by loss of nutrients in the body that is used for egg production. The achievement of peak production supported by a decrease in body weight from the beginning of production to the peak of production is caused by the peak of production with decreased body weight accompanied by a reduction in fat accumulation in the body can maximize egg production, according to the opinion of Mulyantini (2010) which states that the feed excess fat can have an unfavorable effect on egg production because excess animal fat will accumulate around the ovaries and interfere with ovulation.

**Feed Conversion**

Feed Conversion Ratio (FCR) or commonly referred to as feed conversion is the ratio between the amount of feed consumed (Feed Intake) with egg products produced in the same period and unit. The function of the feed conversion calculation is to evaluate the quality and quantity of feed given and then converted to production in 1 kg of eggs. The average conversion of native chicken feed by the addition of sea mussel flour in diets with different levels can be seen in Table 5.

Tabel 5. Average production feed Conversion chicken eggs for 32 days treated

<table>
<thead>
<tr>
<th>Replications</th>
<th>Treatments (R)</th>
<th>R0 (0% TKL)</th>
<th>R1 (1,5% TKL)</th>
<th>R2 (3% TKL)</th>
<th>R3 (4,5 TKL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>3.38</td>
<td>3.29</td>
<td>3.04</td>
<td>3.44</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>3.38</td>
<td>3.29</td>
<td>3.16</td>
<td>3.39</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>3.20</td>
<td>3.18</td>
<td>3.01</td>
<td>3.21</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>3.31</td>
<td>3.12</td>
<td>3.02</td>
<td>3.40</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>3.55</td>
<td>3.10</td>
<td>3.04</td>
<td>3.35</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td><strong>3.36±0.13</strong></td>
<td><strong>3.20±0.09</strong></td>
<td><strong>3.05±0.06</strong></td>
<td><strong>3.36±0.09</strong></td>
</tr>
</tbody>
</table>

Keterangan : Information: a,b,c different superscripts in the same row are significantly different (p<0,05) TKL (SCF): (Sea Clams Flour)
Based on the results of the analysis of variance showed that the addition of sea mussel on the ration had a significant effect ($P <0.005$) on feed conversion. Duncan's test shows that feed conversion in treatments R1 and R2 are significantly different compared to R0 and R3. The addition of sea mussel in the ration with the level of 1.5% and 3% influences feed conversion, which is a decrease when compared to the control treatment or R0 and R3.

As the results of research conducted by Husmaini and Sabrina (2006) revealed that there is a tendency to increase the level of protein in the ration to reduce the conversion of rations for the better. The provision of protein with a level of 19% can result in the lowest feed conversion of 3.49. This indicates that the administration of sea mussel flour by 3% is well digested by livestock. Feed conversion which tends to be low with a balanced weight gain for broilers and high egg production for laying hens is an indication of success in preparing rations. This is in line with the reduction in ration consumption and an increase in egg production with the addition of seashells by 3% in feed. When viewed from the side of livestock, ration efficiency is the ability of chickens to use rations that are eaten to produce weight or certain production such as meat and eggs (Sahzadi et al., 2006)

Feed conversion can be used as a description of the production coefficient, the smaller the conversion value the more efficient the use of rations, meaning that the use of the feed is more economical. Factors that can affect feed conversion include a physical form of feed, chicken weight, nutrient content in the ration, maintenance environment, stress, and gender. Feed conversion calculation is intended to determine the ability of chickens to convert feed consumed into eggs and see the response of chickens to the quality of the feed provided (Lokapirmasari et al. 2011).

**Egg Weight**

The average weight of Arabic chicken eggs with the addition of sea mussel flour in rations with different levels can be seen in Table 6.

Table 6. The average weight of free-range chicken eggs for 32 days treated

<table>
<thead>
<tr>
<th>Replications</th>
<th>R0 (0% TKL)</th>
<th>R1 (1.5% TKL)</th>
<th>R2 (3% TKL)</th>
<th>R3 (4.5 TKL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>36.25</td>
<td>36.84</td>
<td>38.16</td>
<td>35.13</td>
</tr>
<tr>
<td>2</td>
<td>36.22</td>
<td>36.51</td>
<td>39.13</td>
<td>36.38</td>
</tr>
<tr>
<td>3</td>
<td>37.31</td>
<td>37.25</td>
<td>37.52</td>
<td>37.82</td>
</tr>
<tr>
<td>4</td>
<td>36.97</td>
<td>37.69</td>
<td>37.57</td>
<td>36.31</td>
</tr>
<tr>
<td>5</td>
<td>35.37</td>
<td>38.38</td>
<td>38.76</td>
<td>37.43</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>36.42±0.75</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td><strong>37.33±0.73</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td><strong>38.23±0.71</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td><strong>36.41±1.06</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Information: a,b different superscripts in the same row are significantly different ($p<0.05$)

TKL (SCF): (Sea Clams Flour)

The results of the analysis of the diversity of Arabic chicken egg weights showed that the addition of sea mussels to the ration had a significant effect ($P <0.005$) on egg weights. Duncan's test showed that the R2 egg weights were significantly different compared to R0 and R3. The addition of sea mussel in the ration...
with a level of 3% has an influence on egg weight, which is an increase in egg weight compared to other treatments. The increase also occurred in the treatment with the addition of sea mussel by 1.5%, but not statistically significantly different from R0, R2, and R3.

The average yield of eggs in this study was higher than the results of a study conducted by Sulandari et al. (2007), high production of Arabic chicken eggs, i.e. 190-250 eggs/year with egg weights 30-35 g / eggs. In contrast to the results of observations made by Yumna, et al. (2012), with higher yields, the average weight of silver and gold Arabic chickens was 42.75 g/item and 46.81 g / item, respectively, according to Dwiyanto and Prijono (2007) Arab chicken egg weight was 42.5 g / item, in line with the expression Sarwono (2005) which states that the weight of Arabic chicken eggs is 42.4 g/item. Meanwhile, according to the results of research conducted by Muharlien and Nurgiartiningsih (2015) on 17-month-old chickens, revealed that the weight of Arabic chicken eggs ranged from 43.58 to 53.85 g / item. However, the egg weight of the results of this study has met the general standard of Arabic chicken egg weights, as the results of research conducted by Triharyanto (2001), Arabic chicken weights ranged from 35-45 g / item.

An increase in egg weight in the addition of sea mussel by 3% in the ration occurred allegedly due to differences in protein content in the ration, thus affecting the weight of the egg. Listyowati and Roospitasari (2005) stated that the type of feed, the amount of feed, the environment of the cage and the quality of the feed greatly influence the weight of the eggs produced. The same thing revealed by Bell and Weaver (2002) states that several factors that influence chicken egg weight are chicken age, environmental temperature, chicken strain and breed, nutrient content in rations, chicken body weight and egg-laying time. Meanwhile, according to Soeparno et al. (2011), the shape and weight of an egg depend on heredity, age of the mother, season in a year and feed.

CONCLUSION

Based on the results of research on the effectiveness of the administration of sea mussel flour as additional feed on the productivity of free-range chicken in increasing the income of farmers, it can be concluded that the administration of sea mussel flour at various levels as additional feed is the substitution of concentrate on 0% sea mussel (R0), the substitution of concentrate on 1.5% sea mussels (R1), substitution of concentrate on 3% sea mussels (R2), substitution of concentrate on 4.5% sea mussels (R3), where the results of research show that the addition of sea mussels by 3% in feed gives a real influence on egg production, feed conversion and egg weight and feed consumption compared to other treatments. The real influence of the addition of seashells by 3% in feed indicates the efficiency of feed consumption with high productivity, to reduce production costs and increase farmers' income.

REFERENCE

Astuti, P and Suwiningsih. 2010. Production of Arabic Chicken Eggs that Get Feed with Temulreng Supplementation. Scientific Magazine Volume 15 No. 2.


