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The effect of hay alfalfa (*Medicago sativa* L.) supplementation in different basal feed on the feed intake (FI), body weight, and feed conversion ratio of hybrid ducks

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Abstract This study was conducted to determine the effect of hay alfalfa supplementation (*Medicago sativa* L.) in different basal feeds on the feed intake (FI), live weight (LW), Feed Conversion Ratio (FCR), and income of Hybrid Duck. In vivo trial was conducted with 120 MA hybrid ducks (Mojosari x Alabio), based on completely randomized design (CRD). Three (3) treatments and 6 replications with each repetition consisted of 5 ducks. The treatments were P1 = random mixed feed, P2 = 90% random mixed feed + 10% hay alfalfa and P3 = 90% alternative feed + 10% alfalfa hay. Feed was obtained in dry matter but offered as fed. Feed and drinking water was offered ad libitum. The observed variables included feed consumption, live weight, feed conversion ratio (FCR), and income over feed cost. The data obtained were analyzed with the application of Statistical Product for Service Solution (SPSS) version 22 and if there was significant differences in treatment it would be further tested using Duncan's Multiple Range Test (DMRT). The results showed that 10% alfalfa supplementation in free mixed feeds and alternative feeds showed a significant effect (P <0.05) on the value of feed consumption, but not with the other variables. Based on these results it can be concluded that three type of feed has similar potential as feed for duck. However, random mixed feed treatment with 10% alfalfa hay supplementation (P2) is the most optimum treatment among the other treatment feeds, due to the highest live weight income value.

Keywords: Hay Alfalfa, Mixed Feed, Alternative Feed, Performance, Hybrid Duck

1. Introduction

Feed is a dominant portion in the management of poultry farming businesses such as ducks. On large scale or commercial farms, it usually implements more professional feed management compared to smallholder farms. Feed is well prepared so that it can meet its nutritional needs such as dry ingredients, protein, amino acids and minerals. For farmers who want to be practical, they can also buy feed produced by the animal feed industry.

On the smallholder farms, feed with intended for growth performance is often sufficiently prepared with consideration of needs in terms of protein. Poultry in general require more detail in terms of meeting nutritional needs than ruminants. Ruminant calculations are sufficient for protein, whereas poultry needs amino acids. However, smallholder farmers may not necessarily have the skills to calculate nutrient
requirements up to the amino acid level. However practical considerations of the existence of feed sources are usually more dominant than consideration of meeting the overall nutritional needs.

Alfalfa is a good source of protein and rich in mineral and vitamin content [1]. Alfalfa also contains several minerals, namely phosphorus, calcium, potassium, sodium, chlorine, sulfur, magnesium, copper, manganese, iron, cobalt, boron and molybdenum. Alfalfa plants also contain amino acids that are rich in carotenoids, xanthophylls which give carcasses a yellow color [2,3]. The average content of dry matter, organic matter, ether extract and crude protein in fresh alfalfa according to Suwignyo et al. [4] on land without fertilizer and dolomite addition was 18.55%, 87.95%, 8.57% and 28.54%. Alfalfa contains essential amino acids such as Lysine, Leucine, Methionine, and Cysteine found in corn, fish meal and soybean meal, hence alfalfa has the potential to be a substitute or complementary feed ingredient for poultry [5].

Supplementation of alfalfa in different feeds (free mixed and alternative feeds) needs to be studied to determine its effect on livestock performance. The extent of the impact of the presence of alfalfa in free mixed feed formulated only with consideration of crude protein, compared to alternative feed formulated by considering the complete nutritional needs of poultry. Poultry such as ducks also have a good tolerance for fibrous feed. Hence this study was conducted with the aim to determine the effect of alfalfa supplementation in different basal feeds on hybrid ducks on the performance of hybrid duck production.

2. Materials and Methods
Livestock used for the study were MA hybrid ducks (Mojosari x Alabio) male. The equipment used is enclosure equipment including a battery cage with a size of 90 cm x 90 cm x 60 cm, a Medivac Ai brand feed container capacity of 5 kg, a Medivac Ai brand drinking capacity of 2 liters, a wooden litter base and a Camry digital scale with a maximum capacity of 5 kg for weighing feed. The research materials used include hay alfalfa milled with a screen of 0.6 mm, free mixed feed with crude protein and alternative feed with crude protein, 70% alcohol, and medicep to wash feed and drink containers.

The study design was a completely randomized design (CRD) consisting of 3 treatments, 6 replications and each repetition had 5 ducks. The treatments consisted of P1 = radom mixed feed, P2 = radom mixed feed 90% + hay alfalfa 10% and P3 = alternative feed 90% + 10% alfalfa hay. Feed is counted in dry ingredients, but given in as fed. Ducks was maintained for 40 days. Feeding and drinking during maintenance was offered ad libitum. Each feed was supplemented by 10% of hay alfalfa. Each week, body weight gain was checked.

| Table 1. Composition and Nutrient Ration content of Ration Nutrient Content (% BK) | Treatment * |
|-----------------------------------------------|-------------|
| ME (Kcal / kg) | P1 | P2 | P3 |
| Crude protein | 19.35 | 19.34 | 18.80 |
| Crude Fat | 5.68 | 5.77 | 5.85 |
| Crude Fiber | 4.41 | 5.69 | 5.94 |
| Ca | 0.77 | 0.85 | 1.13 |
| Pavailable | 0.69 | 0.01 | 0.69 |
| Lysine | 0.20 | 0.09 | 1.69 |
| Methionine | 0.06 | 0.35 | 0.75 |

* P1: radom mixed feed; P2: radom mixed feed + 10% hay alfalfa, P3: alternative feed + 10% hay alfalfa
2.1. *Feed consumption*

The feed offered will be weighed and recorded, as will the rest of the feed to find out the amount of feed consumption. Feed consumption can be calculated by reducing the feed offered with the remaining feed as follows:

\[
\text{Feed consumption} = \text{Feed offered} - \text{Remaining feed}
\]  

2.2. *Body Weight Growth*

Weighing is done at the beginning and at the end of the maintenance phase. Body weight growth is the difference between initial weight and final weight during maintenance (usually also determined as live weight), which can be seen in the following equation:

\[
\text{Body Weight Growth} = \text{Final Weight} - \text{Initial Weight} \frac{\text{Time (day)}}{}
\]  

2.3. *Feed Conversion Ratio (FCR)*

The FCR value can be calculated by dividing the amount of feed consumed in a given week by the growth of body weight in that week.

\[
\text{FCR} = \frac{\text{Feed consumed (g / head)}}{\text{Weight gain (g / head)}}
\]  

Income Over Feed Cost (IOFC)

IOFC is the total income divided by costs used for duck maintenance

\[
\text{IOFC} = \frac{\text{Income}}{\text{Feed Cost}}
\]  

2.4. *Data analysis*

The research data obtained were analyzed using the Statistical Product for Service Solution version 22 (SPSS Gmbh, Munich, Germany). If there any significant difference in the treatment it will be further tested using Duncan's multiple range test (DMRT) [6].

3. *Results and Discussion*

The Effect of supplementation hay alfalfa on mixed feed and alternative feed on ducks performance which includes Feed Intake (FI), Live Weight (LW), and the value of the Feed Conversion Ratio (FCR) can be seen in Table 2.

| Variable                  | Treatment | P1                | P2                | P3                |
|---------------------------|-----------|-------------------|-------------------|-------------------|
| Feed Intake (g)           |           | 1990,37±28,11b    | 2168,27±13,18c    | 1871,80±38,39a    |
| Live Weight (g)           |           | 760,75±51,56      | 819,06±10,27      | 772,75±25,00      |
| Feed Conversion Ratio     |           | 2,68±0,47         | 2,65±0,10         | 2,43±0,30         |
| Income Over Feed Cost     |           | 1,25              | 1,45              | 1,33              |
| Live Weight Income (Rp)   |           | 4215,28           | 6522,96           | 5007,55           |

Note: different superscript abc show significantly different (P <0.05)

P1 = random mixed feed
P2 = random mixed feed 90% + hay alfalfa 10%
P3 = alternative feed 90% + 10% hay alfalfa
3.1. Feed Intake

Based on the data in Table 2. It showed that 10% supplementation of hay alfalfa in radom mixed feed and alternative feed had a significant effect (P <0.05) on the consumption of hybrid duck. The presence of 10% alfalfa supplementation on radom mixed feed (P2) showed the highest feed consumption compared with all treatments. However, the treatment of alfalfa hay as much as 10% in alternative feed (P3) showed the lowest value of feed consumption compared among all of treatments. According to the research of Suwignyo and Sasongko \[7\] given hay alfalfa at 6% of the ration (with commercial feed during 35 days) showed that the consumption of feed in hybrid ducks was 903.42 grams for 4 weeks, lower than this study (during 40 days) which was 1871.80 grams at P3 and 2168.27 grams at treatment P2 using 10% supplementation of hay alfalfa.

The results of the study on the P3 treatment showed the lowest level of consumption compared to all treatments caused by the level of crude fiber contained on the feed. Wati et. al \[8\] stated that increased crude fiber content causes a decrease in feed consumption. Crude fiber was bulky that can fill digestive tract and tend to reduce the movement of feed rates cause the livestock feels full and stops eating. Pangestu et. al. \[9\] also mentioned that crude fiber has bulky properties consisting of cellulose, hemicellulose and lignin that difficult for duck to digest it.

3.2. Live Weight (LW)

Based on the data in Table 2, it showed that supplementation hay alfalfa of 10% in radom mixed feed and alternative feed had not significant effect (P >0.05) on the LW level of hybrid ducks. Supplementation of hay 10% alfalfa in radom mixed feed (P2) showed the highest BWG numerical value compared to other treatments feed. Suwignyo and Sasongko \[7\] found that Increasing feed intake was closely related to increasing hybrid duck body weight.

Supplementation of hay alfalfa in P2 treatment diets showed the highest level when compared with P3 treatment diets. This is presumably due to the high crude fiber content in 10% hay alfalfa. The high content of crude fiber in the feed could slow down the digestive process resulting in weight loss in hybrid ducks. This was consistent with the opinion Suwignyo and Sasongko \[7\]. The high fiber crude content in the diets will require slow time in the digestive rate to be absorbed by ducks.

Nutrient imbalance in feed could affect the body weight. P2 treatment had the lowest energy and high protein but produces the highest body weight than P3 which has the highest energy and P1 which has the highest protein level. This is consistent with the statement of Zurmiati et. al. \[10\] Diets containing inadequate nutrition will interfere the body weight growth.

3.3. Feed Conversion Ratio (FCR)

Based on the data in Table 2, it showed that 10% supplemented hay alfalfa on radom mixed feed and alternative feed had not a significant effect (P >0.05) on the FCR level of hybrid duck. Supplementation of 10% alfalfa in alternative feed (P3) showed the lowest FCR level compared to other treatment feeds. According Suwignyo and Sasongko research \[7\] the FCR level for the treatment of feed using hay alfalfa was 2.63. This level was higher than the FCR level on P3 treatment but lower than P2 and P3 Treatment.

It also might caused by energy level of the diet, where P3 has the highest energy among the other. Duck will tend to consume lower amount of diet containing high energy. This is related to the body's metabolic status, where the metabolic process for the breakdown of nutrients in feed will produce heat as well as requires energy. So that when livestock are fed with high energy content, their consumption tends to decrease. This was consistent with the opinion Zurmiati et. al. \[10\] the consumption of a duck's ration will be decreased when offered rations with high energy content.

The FCR level could be calculated by dividing feed consumption with body weight growth. Feed conversion can also be used to show the efficiency of livestock production \[7\]. The results showed the highest FCR numerical level was obtained in the P1 treatment. High FCR was caused by increased consumption of feed that was not balanced by growth in body weight. Wati et. al. \[8\] stated that high feed conversion could be influenced by the amount of feed consumption in poultry that was not balanced with increasing body weight during maintenance.
3.4. **Income Over Feed Cost (IOFC)**

IOFC is used as a basis for knowing how much feed costs are used while raising livestock and it could be obtained by measured the difference between total cost income and the cost of expenses. The more efficiently livestock converts the feed they consumed into meat, the better IOFC will be obtained [11].

The results shown on table 2 indicate that P2 treatment used 10% supplementation of hay alfalfa could produces the highest income compared to other treatments. This is in accordance with Suwignyo [12] supplementation of 6% hay alfalfa to the feed could increase income cost.

4. **Conclusion**

Based on the results of the study, it can be concluded three type of feed has similar potential as feed for duck. However, radom mixed feed treatment with 10% alfalfa hay supplementation (P2) is the most optimum treatment among the other treatment feeds, due to the highest live weight income value.

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