Supplementation Alfalfa (*Medicago sativa* L.) in commercial feed on physic and chemical quality meat of hybrid duck

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Abstract. The aimed of this study was to determine the effect of supplementation level of alfalfa (*Medicago sativa* L.) on hybrid duck's meat quality with basal diet commercial feed. This study used in vivo technique on 108 hybrid ducks. The research consisted of 3 treatments and 6 replications, each replication consisted of 6 ducks. The treatments were P1 = commercial feed + 0 % fresh alfalfa, P2 = commercial feed + 5 % alfalfa, P3 = commercial feed + 10 % fresh alfalfa. Alfalfa was calculated in dry matter based but offered in the form as fed. Feed and water was offered ad libitum. The variables measured include product appearance, carcass quality, physic and chemical hybrid duck's meat. One way Completely randomized design was used in this research. All data collected was analyzed with Statistical Package for Sosial Science version 22. Data with significant differences were further tested with Duncan's new Multiple Range Test. Data resulted significant differences ($P < 0.05$) on water content, pH, water holding capacity, and coking loss of the meat among treatment, but not for crude protein, extract ether, and tenderness ($P > 0.05$). Based on the data resulted, it can be concluded that commercial feed with 5 % alfalfa supplementation (P2) was the best treatment to the physic and chemical quality meat of hybrid duck.

Keywords: Hybrid duck, commercial feed, alfalfa, physic meat, chemical meat

1 Introduction

Duck meat is one of many animal protein that high on demand and easy to get by people. Duck meat consumption level increase 13.19 % from 2014 until 2018 [1]. People start to breed duck as an alternatives of animal's protein fulfillment beside chicken meat. The increasing need of duck meat demand incentive breeding, so quality feeding is indispensable for productivity and duck meat quality escalation.

One of the superiority of duck meat is that the meat is more savory compared to chicken meat, because of the accumulation of fat under the skin [2]. Duck meat has a weakness that is relatively high fat compared to other poultry [3]. Animals with high fat can cause a risk of disease for consumers. Improving the quality of duck carcasses can be done by reducing the fat of duck carcasses. One way to improve the quality of duck carcasses is the use of alfalfa supplementation in feed.

Alfalfa is known as a chlorofl producer which is used as a food supplement that can help improve metabolic function in the body. The content of alfalfa nutrients is crude protein of 17.2 % to 24.1 % [4]. Besides protein, alfalfa also contains high vitamins and minerals [5]. High crude fiber in alfalfa can reduce the rate of poultry's food digestion [6]. High levels of saponin on alfalfa which is 2 % to 3 % dry matter functioned as hypocholesterolemic, anti-cancer, anti-inflammatory and antioxidant [7]. Previous studies have shown that alfalfa feeding by 9 % can increase the percentage of breast meat compared to the control group [8]. Nutrient

of alfalfa in the second regrowth is CF 28.80 %, 16 hours 20.92 % DM, 20 hours 89.38 % OM and 9.16 % EE [9]. Alfalfa also containing some essential amino acid like lysine, leucine, methionine, and cysteine which usually found in soybean, corn and fish meal [10].

Based on this potential, alfalfa can be used as a food supplement to reduce cholesterol and improve the quality of duck meat. Therefore, in this study using alfalfa for duck feed supplementation expected to improve the physical and chemical quality of duck meat. Useful to provide information for the public and breeders on the use of alfalfa supplementation which can improve the appearance of production and carcass quality, physical and chemical hybrid duck meat.

2 Materials and methods

The poultries used for the study were MA hybrid ducks (Mojosari x Alabio) obtained from Kulon Progo. Maintenance began when the duck was DOD age until 40 days, ducks are grouped randomly in 18 cages, each cage has 6 ducks according to each treatment. The research materials used include fresh alfalfa, 108 DOD ducks and commercial BR-1 feed from Japfa. This research was experimentally using a Completely Randomized Design (CRD) in one directional pattern with 3 treatments and 6 replications, each replication consisting of 6 ducks. The treatments given were as follows: P0 = Commercial feed + 0 % fresh alfalfa, P1 = Commercial feed + 5 % fresh alfalfa, P2 = Commercial feed + 10 % fresh alfalfa.

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2.1 Feed consumption

The feed offered and the rested were weighed and recorded to find out the amount of feed consumption. According Nuningtyas (2014) Feed consumption can be calculated by reducing the feed offered with the remaining feed as follows:

$$\text{Feed consumption} = \text{Feed offered} - \text{leftover feed} \quad (1)$$

2.2 Physical meat

pH. Meat pH is obtained after cutting and measuring using a pH meter. **Water Holding Capacity.** The water holding capacity is obtained from how much water is bound by the meat using the Hamm method, the formula is:

$$\text{Mg H}_2\text{O} = \frac{\text{wet area}}{0.0948} - 8.0 \quad (1)$$

Cook Loss. The results of cooking loss is obtained from the reduced mass value of the meat after heating or cooking. **Tenderness.** Meat tenderness can be measured using the value of the Warner-Bratzler (WB) breakdown.

2.3 Meat chemical

Water content. Determinated by meat moisture using the method (AOAC, 1984). **Extract Ether.** Determinated by meat fat content using the Soxhlet extraction method. **Crude Protein.** Determinated by meat protein using the Kjeldhal method.

3 Data analysis

Data from this study were analyzed using the Statistical Package for Social Science version 22 (SPSS Gmbh, Munich, Germany). Data with significant differences were further tested with Duncan's new Multiple Range Test (DMRT).

4 Results and discussion

4.1 Chemical quality of hybrid duck meat

The effect of alfalfa supplementation on commercial feed on the chemical quality of hybrid duck meat observed including water level, crude protein and crude fat shown in Table 1.

Tabel 1. Alfafa supplementation impact (0.5.10 %) in ration on hybrid duck meat chemical quality.

Parameter		Alfalfa level(%)		
		0	5	10
Water	Content (%)	75.85±2.40 ^b	75.83±1.87 ^b	81.02±0.21 ^a
Crude	Protein (%)	22.47±1.11	24.14±2.04	21.93±2.02
Extract Ether	(%)	2.94±0.80	2.94±0.85	3.56±2.12

Note:^{a b} numbers with different superscripts show significantly different (P<0.05)

4.1.1 Water content

Table 1 shows that alfalfa supplementation in commercial feed significantly affected the water content of hybrid duck meat (P <0.05). The highest water content is at the alfalfa supplementation by 10 %, while the lowest water content is at the level of alfalfa supplementation at 5 %. Water level is the biggest chemical composition compared to protein and fat from meat. Water is a major component of all animal body tissues and an extracellular constituent. Water also a universal medium [11].

Broiler chicken water level is to 65 % to 80 % [12]. Duck meat water content already high at the time of cutting. It is because the water content in the study influenced by the water content in the two basic ingredients namely duck meat and alfalfa. Meat that stored for a long time will cause water content increasement. Water level increasement caused by microbial activity in meat. This is in in line with [13] opinion, meat that is stored too long will cause the release of water bound to be free water. Thus, the longer the meat is stored will cause an increase in the water level [14].

4.1.2 Crude protein

The results showed the crude protein level of hybrid duck meat in each treatment given alfalfa supplementation of 0 %, 5 % and 10 % respectively 22.47 %, 24.14 % and 21.93 %. The highest crude protein was at the level of alfalfa 5 % supplementation at 24.14 %, while the lowest protein content was at the level of alfalfa 10 % supplementation at 21.93 %. The results of the analysis showed no significant difference (P> 0.05) on the crude protein of hybrid duck meat. Crude protein of the meat is closely related to the storage process. High protein consumption will affect the intake of protein in meat and sufficient amino acids in the body so that the body cells metabolism takes place normally. Whereas treatment with low protein content will have a low meat protein content as well [15]. Based on the measured amino acid content, these results indicate that alfalfa can be a suitable alternative for other feed materials that provide necessary amounts of several amino acids for poultry including corn meal (lysine and tryptophan), soybean meal (methionine, cysteine, lysine and tryptophan) and fish meal (methionine and lysine) [10].

Antioxidants derived from plants are very good in enhancing meat quality because it can inhibit or prevent damage due to the free radicals impact [16]. Alfafa contains saponins, flavonoids as anti-inflammatory, antibodies, antiparasites and antioxidants. Kecombrang extract has a high concentration of antioxidants, and has a strength large enough to prevent free radical compounds so as oxidation prevention [17].

The use of antimicrobial active compounds must be used with high concentrations so that they are toxic to microbes by damaging cell walls and impacting inhibition of microbial growth [18]. The greater the antimicrobial inhibition caused by active antimicrobial

ingredients, so the chemical damage to broiler chicken meat by microbes will be reduced.

4.1.3 Extract ether

The hybrid duck extract ether with the effect of alfalfa supplementation on commercial feed had no significant difference in each treatment ($P > 0.05$). The highest average fat content occurs in the treatment with 5 % alfalfa supplementation. Along with increasing alfalfa supplementation, meat fat levels increase.

Extract ether of broiler chicken breasts ranges from 1.81 % to 2.31 % [19]. The use of active substances such as saponins, vitamin C, flavonoids and tannins also reduce fat accumulation [20]. Alfalfa contains saponins, flavonoids as anti-inflammatory, antibodies, antiparasites and antioxidants. The addition of 5 % alfalfa supplementation is the best treatment compared to the addition of 10 % alfalfa supplementation. High extract ether can be caused by the use of an incorrect number of samples, the length of time of extraction and the improper cooling time. Another possibility is the presence of several substances that are extracted as fat so that the fat level is much greater.

4.2 Physical quality of hybrid duck meat

The results of physical quality examination (pH, Water Holding Capacity (WHC), cooking loss, tenderness) of hybrid duck meat to alfalfa supplementation in commercial feed is presented in Table 2.

Table 2. Effects of alfalfa supplementation (0.5-10%) rations on physical quality hybrid duck meat

Parameter	Alfalfa level(%)		
	0	5	10
pH	6.87±0.04 ^{ab}	6.90±0.08 ^b	6.79±0.11 ^a
WHC (%)	53.50±10.54 ^a	42.62±3.69 ^a	46.62±9.16 ^b
Cooking	25.86±2.53 ^a	30.64±1.94 ^b	28.46±3.74 ^{ab}
Loss(%)	2.34±0.59	2.40±0.43	2.23±0.42
Tenderness(%)			

Note: ^{a b} numbers with different superscripts show significantly different ($P < 0.05$)

4.3 pH

The analysis showed the use of alfalfa supplementation in commercial feed significantly affected ($P < 0.05$) the hybrid duck meat pH. The results showed that the highest pH value at 5 % alfalfa supplementation level was 6.90 and the lowest pH value at 10 % alfalfa supplementation level was 6.79.

The use of feed which has a high carbohydrate content can affect broiler chicken muscle glycogen levels so that it can affect the meat pH [21]. Alfalfa's crude fiber is one of the feeds that affects the pH value. Higher alfalfa supplementation can reduce the meat's pH. That feed supplemented with purslane flour by the highest administration (6 %) can reduce the pH value [22]. The control feed had a pH value of 5.91 % while the 6% supplementation feed was 5.77 %.

4.4 Water holding capacity

Alfalfa supplementation of hybrid duck meat water holding capacity on commercial feed has a different value in each treatment. The highest average value of water holding capacity shown in the treatment with alfalfa supplementation of 0 %. Along with increasing alfalfa supplementation, the binding capacity of the meat water decreases.

The average value of water holding capacity by alfalfa supplementation of 0 %, 5 % and 10 % in commercial feed has a significant effect ($P < 0.05$) on hybrid duck meat. The most water holding capacity of hybrid duck meat is in the treatment of 0 % alfalfa supplementation, because more reactive groups can increase water molecules. The high water holding capacity can also be caused by the high and low pH of the meat produced. A decrease in pH causes denaturation of proteins [23]. As a result of protein denaturation, there is a decrease in protein solubility which causes the water holding capacity to decrease.

The ability of meat to hold water is an important trait. High water holding capacity, so the meat has good quality. The water holding capacity in this study is within the normal range. The water holding capacity of meat is around 20 % to 60 % [24]. In connection with the explanation above, it can be concluded that the decreasing water content of hybrid duck meat.

4.5 Cooking loss

The highest average value of cooking loss occurred at 5 % alfalfa supplementation in commercial feed by 30.64 %. The analysis showed that the use of alfalfa supplementation in commercial feed significantly affected ($P < 0.05$) the pH of hybrid duck meat. The amount of cooking loss is influenced by the pH value and the holding capacity of meat water. The higher the temperature and cooking time, the higher cooking loss values in broiler chickens [25].

This is consistent with the results of the study, the highest value of cooking loss in alfalfa supplementation of 5 % in commercial feed was 30.64 % with a water holding capacity of 42.62 %. The results obtained are classified in the normal range. The value of meat cooking loss is generally between 1.5 % to 54.5 % with a range of 15 % to 40 % [26].

This is in accordance with the study done which are factors that affect cooking loss including pH value, length of muscle fiber sarcomeres, pieces length of muscle fibers, myofibril contraction status, sample size and weight, meat cross section, heating, variety related to meat fat, age, and energy consumption in feed [27]. The value of cooking loss is closely related to the water holding capacity [28]. The higher water holding capacity will result in lower cooking loss in meat. This is consistent with the results of the study, the highest value of cooking loss in alfalfa supplementation of 5% in commercial feed was 30.64 % with a water holding capacity of 42.62 %.

The amount of cooked meat loss is influenced by the pH of the meat. The pH value affects cooking loss [26]. The value of cooking loss in the study has the highest of

giving 5 % alfalfa supplementation in commercial feed of 30.64 % with a pH of 6.90 while the lowest cooking loss comes from giving alfalfa supplementation of 0 % with a pH of 6.87.

4.6 Tenderness

The tenderness level of hybrid duck meat with alfalfa supplementation of 0%, 5 % and 10 % in commercial feed showed no difference. The results of the analysis did not significantly effect ($P > 0.05$) on the hybrid duck meat's tendency. Increased tenderness occurs in the administration of alfalfa 5 % by 2.40 %. Tenderness is closely related to the process of boiling meat.

Supplementation of 10 % alfalfa in commercial feed had no effect on meat tenderness because there was no change in the structure of the auto protein. Boiling the meat causes damage and changes in the structure of muscle protein, especially in actin and myosin. The process of boiling meat is one way to softening meat with cooking, it can causes protein denaturation. Protein denaturation is the breakdown of proteins into smaller units [29]. One of the factors that affect meat tenderness is the postmortem factor, one of which is the cooking method by boiling [24].

5 Conclusion

Based on the results of the research, it can be concluded that the best treatment of alfalfa supplementation feed to determine the meat physical and chemical best quality that is the treatment with 5 % alfalfa supplementation on commercial feed. for the future maintenance should be carried out in a longer period of time.

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