The Effect of Vegetable oils (Palm Oil, Canola, Coconut and Soybean Oil) on the Ration of Slaughter Weight, Carcass Weight, Carcass Percentage, and Abdominal fat Percentage of male ducks

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Abstract. This study aims to analyze the effect of different vegetable oils on the basal ration of slaughter and carcass weight, carcass percentage, as well as abdominal fat, percentage in 9 weeks old of male ducks. It was conducted using a Completely Randomized Design (CRD) in an unidirectional pattern with 4 treatments and 6 replications with 6 ducks in each test. The treatments in this study include; P1: (96% basal ration + 4% palm oil); P2: (96% basal ration + 4% canola oil); P3: (96% basal ration + 4% coconut oil) and P4: (96% basal ration + 4% soybean oil). Furthermore, the data were analyzed using the one way analysis of variance (ANOVA), meanwhile Duncan's multiple range test (DMRT) was applied when significant differences were indicated among treatments. The analysis showed that the treatments have no significant effects (P>0.05) on the variables examined in this study. Based on the results that the addition of different types of vegetable oil in the basal ration failed to increase slaughter weight, carcass weight, carcass percentage, as well as the abdominal fat percentage in male ducks.

1. Introduction

Local ducks are widely used in several communities to produce meat and eggs. The national duck meat and egg production in 2016 were 36,346 tons and 290,110 tons respectively [1]. Meanwhile, duck production is widely practiced and in great demand in many parts of the world. Compared to chicken, the duck mean is distinctly characterized as a red meat [2].

Soybean oil and animal fat, or it combinations are energy resources for poultry diets. Previous report showed that digestion in poultry is improved by dietary animal-vegetable oil mixes (A-V mix) [3]. Furthermore, the addition of vegetable fats and oils in feed is an alternative approach widely used in the world of modern poultry to increase the energy component in feed. Apart from providing energy, it also increases the absorption rate of vitamins, as well as palatability and feed efficiency. In addition, this component also reduces the rate of feed in the digestive tract thereby enhancing the absorption of
feed nutrients [4]. These non-conventional feeds include local vegetable oils (eg. palm kernel oil, palm oil, coconut oil) and agro-industrial by-products (AIBP) such as palm kernel meal, coconut meal and cottonseed meal. The economic incentive for using these local feed ingredients is the favorable cost compared to cereals and other oilseeds (soyabean, linseed, etc.) [5].

The fatty acid profile of feed supplemented with coconut oil has long-chain saturated fatty acids such as palmitic, palmitoleic and oleic acids. Meanwhile, soybean oil supplemented feed is rich in linoleic and linolenic acid [6]. Additional poultry treatment using 3% vegetable oil resulted in a significant increase in body weight and feed conversion however there was no difference in internal organ weights [7]. The duck feed is optimized by adding ingredients such as vegetables oil in the diets. Therefore, there is need to examine the effect of vegetable oils (palm oil, canola, coconut, and soybean oil) on the ration of slaughter and carcass weight, carcass percentage, as well as abdominal fat percentage of male ducks.

2. Materials and methods

2.1. Treatment and Experimental Diets

This study was conducted for a period of 9 weeks with a total of 144 ducks divided into 4 treatment groups, and 6 replicates containing 6 ducks each. The treatments include; P1: (96% basal ration + 4% palm oil); P2: (96% basal ration + 4% canola oil); P3: (96% basal ration + 4% coconut oil); and P4: (96% basal ration + 4% soybean oil).

2.2. Research methods

The feed formulation was prepared as an energy, protein and vitamin-mineral source in a basal feed in line with the ration required by the ducks until it was homogeneous. Moreover, the diets were comprised of yellow corn, pollard, rice, soybean, premix, NaCl, limestone, and vegetable oils. The basal diets contained 19-20% crude protein and metabolize energy ranging between 3200 to 3300 kcal/kg. Feeds composition and nutrient content of treatment diets are presented in Table 1.

2.3. Growth performance

The live weight and feed consumption of the ducks were recorded on weekly basis, while the average daily gain (ADG), and feed intake (FI) were calculated.

2.4. Carcass collection

The slaughter and carcass weight data were collected when the ducks were eight weeks old while slaughtering was carried out with two ducks per replicate hence totalling 30 ducks. This was in line with [8], which begin with a 12-hour mastery of emptying food in the digestive tract, thereafter slaughtering was done by cutting the carotid artery, jugular vein, trachea, and esophagus. After cutting this four channels, the feathers were removed by dipping the ducks in hot water for 35-45 seconds. The carcass is the body of poultry obtained after slaughtering based on Islamic sharia, which involve extracting feathers, evisceration, separation of the head, neck, and legs (shank) [9]. Furthermore the breast was separated at the extreme part of the scapula and the dorsal ribs, while the weight of the breast was measured by weighing the breast after separating it from the carcass. The thighs were separated in the acetabulum, together with the pelvic muscles whereas the pelvic bones were not included with the thighs and the dorsal end of the tarsus metatarsus bone. In addition the back was separated from the pelvic while the tip of dorsal scapula and ribs were separated from the posterior part of the neck, the wings are separated through pieces of shoulder joints.
Table 1. Feedstuffs composition (on dry matter basis) and nutrient content of experimental diets

| Ingredients              | T1 (Palm oil) | T2 (Canola oil) | T3 (Coconut oil) | T4 (Soybean oil) |
|--------------------------|---------------|-----------------|------------------|------------------|
| Yellow corn (%)          | 37            | 37              | 36.75            | 37.50            |
| Pollard (%)              | 10.25         | 10.25           | 11.25            | 9.75             |
| Rich polish (%)          | 24.5          | 23.25           | 23.75            | 23.50            |
| Soy Bean Meal (%)        | 21.5          | 22.75           | 21.50            | 22.50            |
| Premix (%)               | 2.35          | 2.35            | 2.35             | 2.35             |
| Limestone (%)            | 0.30          | 0.30            | 0.30             | 0.30             |
| NaCl (%)                 | 0.10          | 0.10            | 0.10             | 0.10             |
| Vegetables Oils          |               |                 |                  |                  |
| Palm oil (%)             | 4             | 0               | 0                | 0                |
| Canola oil (%)           | 0             | 4               | 0                | 0                |
| Coconut oil (%)          | 0             | 0               | 4                | 0                |
| Soybean oil (%)          | 0             | 0               | 0                | 4                |
| Total (%)                | 100           | 100             | 100              | 100              |
| ME, kcal/kg              | 3258.97       | 3262.89         | 3241.44          | 3266.61          |
| Crude protein, %         | 19.64         | 20.14           | 19.71            | 19.99            |
| Crude fiber, %           | 6.09          | 6.02            | 6.11             | 6.00             |
| Extract ether, %         | 5.64          | 5.56            | 5.61             | 5.56             |
| Ca, %                    | 0.97          | 0.98            | 0.98             | 0.98             |
| P av, %                  | 0.71          | 0.71            | 0.71             | 0.71             |

2.5. Percentage and carcass portion

With reference to a previous study, the weight of duck carcass is obtained by separating the legs, head, feathers and removing internal organs together with the entire blood. A large percentage of carcasses and parts (thighs, breast, wings, and back) according to [10] is obtained from the formula:

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\text{Percentage of carcass} = \frac{\text{Carcass weight}}{\text{Slaughter weight}} \times 100\%
\]

\[
\text{Percentage of carcass portion} = \frac{\text{Carcass portion weight}}{\text{Carcass weight}} \times 100\%
\]

2.6. Abdominal Fat Weight (gram/head)

The weight of the ducks' abdominal fat was obtained by weighing the fat obtained from the gizzard area and the attached layer between the abdominal muscles and intestines.

2.7. Percentage of Abdominal Fat (%)

The percentage of abdominal fat was obtained by dividing the weight of the abdominal fat by the cut weight and then multiplying it by 100%.

2.8. Data Analysis

This study was conducted using one-way completely randomized design while data analysis was performed using analysis of variance (ANOVA). Furthermore differences between the mean of
treatments were further analyzed using Duncan’s New Multiple Range Test (DMRT) with significance level of \( P<0.05 \).

3. Results and Discussion

The results on slaughter and, carcass weight, carcass percentage, abdominal fat and percentage of local male ducks aged 9 weeks ration of different vegetable oils in the ration is presented in Table 2.

**Table 2.** Slaughtering weight, carcass weight, carcass percentage, abdominal fat and abdominal fat percentage of local male ducks aged 9 weeks

| Variable                      | Treatment | P Value |
|-------------------------------|-----------|---------|
| Slaughter weight (g)          | P1        | 1151.00±119.06 |
|                               | P2        | 1035.83±223.29   |
|                               | P3        | 1183.50±132.23   |
|                               | P4        | 1080.92±145.49   |
| Carcass weight (g)            | P1        | 661.33±73.94    |
|                               | P2        | 577.50±134.35   |
|                               | P3        | 653.75±88.18    |
|                               | P4        | 602.83±66.35    |
| Carcass percentage (%)        | P1        | 57.44±1.99      |
|                               | P2        | 55.59±1.40      |
|                               | P3        | 55.16±2.42      |
|                               | P4        | 55.98±2.19      |
| Abdominal fat (g)             | P1        | 9.36±5.03       |
|                               | P2        | 3.90±3.80       |
|                               | P3        | 6.67±5.57       |
|                               | P4        | 6.08±2.25       |
| Abdominal fat percentage (%)  | P1        | 0.81±0.40       |
|                               | P2        | 0.34±0.27       |
|                               | P3        | 0.56±0.39       |
|                               | P4        | 0.55±0.16       |

Note: P1 : 96% basal ration + 4% palm oil; P2: 96% basal ration + 4% canola oil; P3: 96% basal ration + 4% coconut oil and P4: 96% basal ration + 4% soybean oil

3.1. Slaughter Weight

Slaughter weight is the weight of poultry before slaughter and after fasting for 12 hours. The average slaughter weight obtained in this study is presented in Table 2. Based on the results, the treatments have no significant effects (\( P>0.05 \)) on the slaughtered weight of local ducks. Also, the addition of 4% different vegetable oils have no effect on the slaughter weight as the four treatments showed no significant differences.

These results were in line with a previous study [11] which reported that the provision of 1% calcium oil in commercial rations to native hen had no significant effect on slaughter weight (\( P>0.05 \)) however the provision of 2% and 3% calcium oil caused a significantly reduction (\( P<0.05 \)) compared to the control. Furthermore, the addition of 2% VCO waste increase slaughter weight (\( P<0.05 \)). This was consistent with a previous study which reported that higher level VCO treatment increased the slaughter weight of broiler chickens [12]. Meanwhile the administration of rations containing bay or papaya leaves as well as katuk leaves supplemented with Starpig failed to increase the slaughter weight of rejected Bali ducks [13].

Slaughter weight is influenced by body weight gain and age. Meanwhile the former is also affected by nutrient intake and digestion. According to a previous study, adequate nutrition and digestion culminated into a distinctive body weight gain and indirectly resulted in higher slaughter weight [8].

Furthermore the slaughter and carcass weight are closely related. Based on the results, both variables showed no significant differences. This was in line with the opinion of [14] which reported that the production of broiler carcass was closely related to its live weight, where the greater the weight of the cut, the higher the carcass weight. In addition, the weight and volume of chicken meat are directly determined by the weight, carcass, sex, and age of slaughter. It is also closely related to the percentage of carcass, which is a large sliced portion of weight in the same direction [15].
3.2. Carcass Weight and Percentage

Carcass percentage is the ratio of carcass weight to slaughter weight multiplied by 100%. The mean weight and percentage of carcasses obtained in this study were presented in Table 2. Statistical analysis showed that the treatments had no significant effects (P>0.05) percentage. Therefore, based on the results, the addition of 4% different vegetable oils had no effect on the weight and percentage of duck carcasses as the four treatments showed no significant effect. These results were similar to [16] which reported that the addition of soybean oil and palm oil in feed as a source of fat had no significant effect on the percentage of eviscerated duck carcasses. This value was higher compared to this study where 69.35% and 72.90% were obtained with the addition of soybean oil and palm oil respectively. Moreover, the carcass percentage in this study was higher compared to [17] which reported that the average carcass percentage of the of male local ducks aged 10 weeks treated with 0; 0.05; 0.10; and 0.15% enzymes in the ration ranged between 52.93 to 54.78%. This was supported by [18] which reported that the use of coconut oil was up to 2% in super-range chicken rations resulted similar carcass percentage between treatments but showed significant results on carcass weight. Therefore, the addition of coconut oil increases the carcass weight of super native chicken.

The results obtained in this study were contrary to [19] which noted that the body weight of broilers in the finisher period increased with rising coconut oil level added to the ration, sohence, the final result in the form of carcass also increased. The use of coconut oil in rations at various levels of 0%, 1%, 2% and 3% significantly increased body and carcass weight together with a significant effect on consumption and feed conversion of broiler in the finisher period. Similarly, the addition of betel leaf solution at a level of 2.5%, 5% and 7.5% in local male duck feed indicated a significant increase (P<0.05) in carcass percentage of 58.67%, 58.33% and 60.00%, respectively compared to the control [20]. When the carcass weight and percentage showed no significant difference, the slaughter weight is also constant [21].

3.3. Weight and Percentage of Abdominal Fat

Abdominal fat is the body fats located in the abdominal cavity. The mean weight and abdominal fat percentage are presented in Table 2. Statistical analysis showed that the weight and abdominal fat percentage with the addition of different vegetable oils in the ration had no significant effect (P>0.05). Therefore, the addition of 4% different vegetable oils to the ration had no significant on the weight and abdominal fat percentage as the four treatments showed insignificant differences.

The results of this study were almost similar to [16] which noted that the addition of soybean oil and palm oil in feed as a source of fat had no significant effect on the percentage of ducks' abdominal fat. This percentage was lower compared to the value obtained this study, namely 2.64% and 2.73% for soybean oil and palm oil feed respectively. These results were contrary to [22] which stated that the higher the percentage of crude palm oil used in feed, the higher the abdominal fat percentage. This was supported by [23] which also showed that the use of different oils (frying residue oil, palm oil and bran oil) had a significant effect (P<0.05) on the relative weight of abdominal fat in broiler chickens. Similar results were obtained by [18] which reported the same results that the use of coconut oil up to 2% in super-range chicken rations resulted in equal value of abdominal fat between treatments. Meanwhile, abdominal fat deposits in poultry are influenced by several factors, such as genetics, nutrition, gender, age and environmental factors [24].

4. Conclusion

Based on the results, the addition of different vegetable oil in the basal ration have no significant effect on slaughter and carcass weight, carcass percentage, as well as abdominal fat percentage in male ducks.
Acknowledgements
This research was funded by the research project of Sebelas Maret University (PNBP UNS Nomor: 452/UN27.21/PN/2020).

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