JPPIPA 11(1) (2025)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Duckweed (*Lemna minor*) in Feed to Increase the Carcass and Giblet Proportion of Male Alabio Ducks

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Received: October 29, 2024
Revised: November 12, 2024
Accepted: January 25, 2025
Published: January 31, 2025

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DOI: 10.29303/jppipa.v11i1.9713

Abstract: Feeding containing wet duckweed increases the feed conversion ratio. This research aims to analyze the effect of differences in the use of wet duckweed and duckweed flour in rations on the percentage of carcass and giblet cuts of male Alabio ducks. This research was carried out in the Experimental Cages of the Faculty of Agriculture, Lambung Mangkurat University using 108 Alabio ducks. The study used three treatments, namely P0 (control, without duckweed), P1 (20% wet duckweed in the ration), and P2 (20% duckweed flour in the ration). The parameters observed included the percentage of chest, thigh, back, wing and giblet weight to carcass weight. Duckweed with complete feed has the same results so it can be used as a substitute feed and between the two treatments P1 and P2 it is known that the use of wet duckweed gives the best percentage of carcass cuts.

Keywords: Alabio duck; Duckweed; Feed

Introduction

Indonesia has many types of local ducks, each with its own advantages and disadvantages. Local ducks are said to be the germplasm of livestock in Indonesia, which are the Anas domestica species (Alfauzi & Hidayah, 2022; Djannah, 1985), while the local ducks in South Kalimantan are Alabio ducks. Alabio Ducks (Anas plathyrhyncos Borneo) were formerly known as banar ducks or bujur ducks. The naming of Alabio ducks was based on the habits of people who wanted to buy duck seeds at the Alabio market (Yusuf et al., 2019; Solihin et al., 2018). Alabio ducks are one of the germplasms of local poultry groups which have a native geographical distribution in South Kalimantan as determined by Decree of the Minister of Agriculture Number 2921/Kpts/OT.140/6/2011 dated 17 June 2011. Alabio ducks are named after their area of origin, namely Alabio District, Hulu Sungai Utara Regency (HSU) (Fitriyanti & Pradana, 2021).

Suryani (2013) stated that female Alabio ducks are capable of producing more than 200 eggs/year market (Fitriyanti & Pradana, 2021). Supporting factors in maintenance are feed. Feed is one of the factors determining the success of a duck farming business. Selecting the right feed ingredients will produce quality feed that can meet livestock needs. The cost of feed in poultry production, especially Alabio ducks, is the largest cost component, up to 70% of production costs (Sulaiman & Basransyah, 2022; Ismoyowati et al., 2020; Chantiratikul et al., 2010).

Efforts to increase the growth of broiler ducks and increase the percentage of carcass quality must take into account the amount and quality of feed. Efforts to streamline feed costs through substitution of feed ingredients that are available nearby and whose production is abundant. One alternative feed that can be used as a feed ingredient to replace commercial feed is duckweed.

Duckweed is one of the aquatic weeds that can thrive in tropical areas such as Indonesia. The species of duckweed is Lemna minor, a small, free-floating plant with a very wide distribution throughout the world (Baehaqi, 2022; Ranto, 2005; Syampurnomo et al., 2017). In addition to growing quickly and fertile so that it is available throughout the year, duckweed contains

How to Cite:
Herliani, Biyatmoko, D., Sulaiman, A., Habibah, & Amilia, P. (2025). Duckweed (Lemna minor) in Feed to Increase the Carcass and Giblet Proportion of Male Alabio Ducks. *Jurnal Penelitian Pendidikan IPA*, *11*(1), 99–105. https://doi.org/10.29303/jppipa.v11i1.9713

protein variations of 15-45% of dry matter basis and has been tested as additional feed for chickens or ducks (Indarsih & Tamsil, 2012; Curlley et al., 1981; Kabier et al., 2005). Duckweed protein has a high concentration of essential amino acids such as lysine, methionine, and is high in minerals similar to soybeans and animal protein and has carotene and xanthophyll pigments, that duckweed can replace 50% fish meal in conventional rations for ducklings.

Indarsih et al. (2012) at the 20% level showed that feeding containing wet duckweed increased the feed conversion ratio. Wet duckweed has a short shelf life, so it is necessary to reduce the water content to extend the shelf life of duckweed, namely by turning it into flour through a drying process. This research aims to analyze the effect of differences in the use of wet duckweed and duckweed meal in rations on the percentage of carcass and giblet pieces of male Alabio ducks.

Method

This research was conducted at the Experimental Cage of the Faculty of Agriculture, Lambung Mangkurat University. Alabio ducks used were 108, the treatment in this research was as follows:

P0 = Level of use of 0% duckweed in the ration (control)
P1 = Level of use of 20% wet duckweed in the ration
P2 = Level of use of 20% duckweed meal in the ration

The nutritional content of the treatment ration is composed of isoprotein and isocalorie. In the starter phase (0-2 weeks), ducks are given commercial feed (BR 1 Comfeed) with a PK content of 22% and EM 3100 Kcal/kg, then in the finisher phase (3-12 weeks), they are given a ration with a PK content of 16% and EM 3000 Kcal/kg.

Research Parameters

Percentage of chest weight (%)

Chest weight is obtained by weighing the chest from the scapula area to the sternum. The percentage of chest weight is calculated using the following formula:

$$\text{Chest weight percentage (\%)} = \frac{Chest\ weight\ (g)}{Carcass\ weight\ (g)} \times 100\% \quad (1)$$

Wing percentage (%)

Wing weight is obtained by weighing the joint between the upper arm and the scapula. The wing weight percentage is calculated using the following formula:

$$\text{Wing weight percentage (\%)} = \frac{wing\ weight\ (g)}{Carcass\ weight\ (g)} \times 100\% \quad (2)$$

Thigh weight Percentage (%)

Thigh weight is obtained by weighing the exact part in the lower thigh joint area to the knee. The thigh weight percentage is calculated using the following formula:

$$\text{Thigh weight percentage (\%)} = \frac{thigh\ weight\ (g)}{Carcass\ weight\ (g)} \times 100\% \quad (3)$$

Back percentage (%)

Back weight is obtained by weighing the spine to the pelvis. The back weight percentage is calculated using the following formula:

$$\text{Back weight percentage (\%)} = \frac{back\ weight\ (g)}{Carcass\ weight\ (g)} \times 100\% \quad (4)$$

Giblet percentage (%)

Giblet weight is obtained by weighing the liver, gizzard, and heart. The percentage of giblets is calculated using the following formula:

$$\text{Giblet percentage (\%)} = \frac{Giblet\ weight\ (g)}{Carcass\ weight\ (g)} \times 100\% \quad (5)$$

Result and Discussion

Chest Weight

The average results of breast cuts of male Alabio ducks are presented in the following table:

Table 1. Average Breast Cut of Male Alabio Ducks Kept for 10 Weeks

Treatment	Average (%) ± SEM
P0	29.33 ± 7.66^{b}
P1	24.00 ± 5.48^{b}
P2	12.83 ± 12.27^{a}

Description: Numbers followed by different superscripts in the same column indicate significantly different results ($p<0.05$).

The chest piece is the part that contains the most muscle tissue. Muscle growth is influenced by protein, especially amino acids. Based on the results of the analysis of variance, it showed that giving duckweed flour in the ration for 10 weeks resulted in significantly different results ($p<0.05$) for breast cuts of male Alabio ducks. The results of the Duncan test showed that the highest breast cut was in P0 (29.33 g) without treatment and the lowest cut was in P2 (12.83 g) with the use of 20% duckweed flour.

The value shown by the P1 treatment is almost balanced with the P1 treatment, this shows that the provision of wet duckweed (P1) is better and has almost balanced nutritional value, so that wet duckweed can be

used as a protein substitute feed. It can be seen that giving wet duckweed at a level of 20% is able to provide higher breast cuts compared to giving duckweed flour due to the different duckweed protein quality content. The average breast cuts obtained in this study ranged from 12-29%. The average percentage of breast pieces from local ducks kept for 10 weeks is slightly higher than what was stated to be lower than Dewanti et al. (2013) the percentage of chest pieces from male ducks kept for 10 weeks is 26%.

The low average breast cut in the P2 treatment is thought to be related to the crude fiber content in duckweed meal. The higher the percentage of crude fiber in the ration will reduce the percentage of carcass and carcass cuts. Increasing the level of crude fiber in the ration will reduce the digestibility of nutrients, so that the balance of energy and protein absorbed by the body decreases. The decrease in energy and protein balance causes the formation of body components to decrease, as a result the weight and percentage of carcasses and carcass cuts also decrease. Because the chest carcass cut has heterogeneous growth (Natasasmita, 1990; Daud et al., 2016; Herdiana et al., 2014) the rate of decrease in chest weight is higher than the carcass, so that the smaller the carcass weight, the smaller the percentage of chest.

Wing Weights

The average results of the breast cuts of male Alabio ducks are presented in the following table:

Table 2. Average Wing Cuts of Male Alabio Ducks Raised for 10 Weeks

Treatment	Average (%) ± SEM
P0	10.67 ± 4.68
P1	14.33 ± 3.01
P2	13.00 ± 6.33

Description: Numbers followed by different superscripts in the same column indicate significantly different results ($p<0.05$).

The wing is the part of the carcass that consists of bones and is covered in feathers, this is what causes the percentage of wings to be higher than other parts. The results of the analysis of variance showed that the administration of wet duckweed and duckweed flour had no significant effect ($p<0.05$) on the wing clippings of 10 week old male Alabio ducks. This shows that the use of wet duckweed and duckweed flour at a level of 20% did not affect the wing cuts of male Alabio ducks. Because duck wings are a carcass component that has relatively constant growth until the age of 8 weeks (Antaraini et al., 2020; Matitaputty et a.l, 2011; Erisir et al., 2009).

Massolo et al. (2016) stated that the small amount of meat deposits in carcass parts is influenced by the large percentage of bone. The wing section is dominated by bone components and has less potential to produce meat. Soeparno (1998) stated that the parts of the body that have a lot of bones are the wings, back, head, neck, and legs. The bone component is the component that grows first so that rations and other nutrients are first used for bone formation, in accordance with Wahyu's opinion (1997), that bones are formed at the beginning of the growth period. Rasyaf (1995), Anggorodi (1995), Windhyarti (2002) and Srigandono (1997) stated that body growth which then forms carcasses consists of three main tissues, namely bone tissue that forms the skeleton, muscle tissue or tendons that form meat, and fat tissue. Rasyaf (1995) further explained that among the three tissues, bone, followed by tendon growth as the earliest growing meat, while fat grows last. Irham (2012) stated that the weight of the wings and back was almost the same in each treatment because the wings and back were not the main places where meat deposition occurred, so that during the growth period, nutrients for meat formation were found in places where meat deposition occurred.

Thigh Weight

The average results of thigh cuts for male Alabio ducks are presented in Table 3 below:

Table 3. Average Thigh Cuts of Male Alabio Ducks Kept for 10 weeks

Treatment	Average (%) ± SEM
P0	22.50 ± 4.68
P1	24.83 ± 2.04
P2	22.17 ± 6.91

Description: Numbers followed by different superscripts in the same column indicate significantly different results ($p<0.05$).

Thigh cuts are the largest place for meat deposits in duck carcasses apart from the chest (Putra, 2015). The results of the analysis of variance showed that the results of thigh cuts from male Alabio ducks reared for 10 weeks were not significantly different ($p<0.05$) from the treatments. The use of wet duckweed in the treatment ration showed that the highest thigh cuts were in P1 (24.83 g) and the lowest thigh cuts were in P2 (22.17 g) with a wet duckweed usage level of 20%. However, overall the percentage of thigh weight produced was relatively the same. The average percentage of thigh cuts obtained in this study was 22-24%, this is higher than that stated by Leclerq et al. (1985), the average percentage of thigh cuts for local ducks reared for 10 weeks was 16.3%.

It can be seen in the table that giving wet duckweed at a level of 20% is better than duckweed flour with the same level of giving, due to the difference in protein content in the two ingredients and can be used as an alternative protein ingredient for rations, even comparable to the quality of ration protein so that thigh cuts are achieved, higher than the control (P0) and 20% duckweed flour (P2). The ration content that greatly influences carcass formation is protein. The protein content in the ration is needed by livestock for body tissue growth. Soeparno (1998) said that one of the ingredients in feed that influences tissue growth in carcass formation is protein. Mahesa et al. (2022) and Zurmiati et al. (2017) stated that by meeting the protein needs of ducks, it is hoped that the resulting growth will also be maximum

Back Weight

The average results of back cuts of male Alabio ducks are presented in Table 4 as follows:

Table 4. Average Back Cuts of Male Alabio Ducks Kept for 10 Weeks

Treatment	Average (%) ± SEM
P0	22.83 ± 11.37
P1	25.83 ± 11.72
P2	29.17 ± 9.76

Description: Numbers followed by different superscripts in the same column indicate significantly different results ($p<0.05$).

The back is the part that has the largest proportion of bones compared to other parts. The results of the analysis of variance showed that the administration of wet duckweed and duckweed flour had no significant effect ($p<0.05$) on the back cuts of 10 week old male Alabio ducks. This shows that the use of wet duckweed and duckweed flour at a level of 20% did not affect the back cuts of male Alabio ducks. The average percentage of back cuts in the study was 22-29%. The percentage of the back is composed of most of the bone framework and a little muscle tissue. Resnawati (2004) and Ramdani (2016) stated that the back of broiler chickens is mostly composed of bone tissue and a little muscle tissue, so the mineral content in the feed has a greater influence on the weight of the back. Irham (2012), Suci et al. (2020) and Nugraha et al. (2012) stated that the weight of the wings and back was almost the same in each treatment because the wings and back were not the main places where meat deposition occurred, so that during the growth period, nutrients for meat formation were found in places where meat deposition occurred.

Giblet Percentage

The average results of back cuts of male Alabio ducks are presented in Table 5 as follows:

Table 5. Average Back Cuts of Male Alabio Ducks Kept for 10 Weeks

Treatment	Average (%) ± SEM Giblet Section			
	Giblet	Heart	Liver	Gizzard
P0	10.00 ± 4.05	1.50±1.22	3.33±0.51	3.67±0.81
P1	10.50 ± 5.24	1.17±0.40	3.83±0.98	4.83±1.47
P2	11.83 ± 6.65	2.00±2.45	3.67±0.51	4.67±1.03

Description: Numbers followed by different superscripts in the same column show significantly different results ($p<0.05$).

Giblet is part of a poultry carcass which is an edible by-product, consisting of liver, heart and gizzard (gizzard) obtained from weighing results after being removed from the cleaned carcass (Suryanah et al., 2016). The results of analysis of variance showed that giving wet duckweed and duckweed flour had no significant effect ($p<0.05$) on the giblet percentage of male Alabio ducks aged 10 weeks. This shows that the use of wet duckweed and duckweed flour at a level of 20% did not affect the percentage of giblet in male Alabio ducks. It can be seen that the table does not show a significant percentage, but treatment P2 obtained the highest percentage of giblets compared to treatments P0 and P1. However, overall the average results obtained between treatments were relatively similar.

The liver is an organ that makes up giblets. The difference in weight and percentage of liver is influenced by how much work the liver does in the animal's body. Factors that affect liver weight are body weight, species, gender, age, and pathogenic bacteria. The results of the analysis of variance showed that the use of wet duckweed and duckweed meal in the diet had no significant effect on the liver weight of male Alabio ducks during the study. Normal liver weight ranges from 2-5% of live weight. The liver has several functions, namely the exchange of substances from protein, fat, bile secretion, detoxification of toxic compounds and excretion of metabolite compounds that are no longer useful for the body (Afif, 2002). Differences in liver weight are determined by the amount of liver work in the livestock's body. The average percentage of liver of male Alabio ducks given wet duckweed and duckweed flour ranged between 3.33%-3.83% with the highest average value in treatment P1 and the lowest average in treatment P0. Factors that affect liver weight are body weight, species, gender, age, and pathogenic bacteria. On average, the condition of the liver is normal, the surface is smooth and no damage was found to the liver

supported by the consistency and reddish brown color of the liver.

The heart is a muscular organ that plays an important role in blood circulation which is divided into four chambers, namely two chambers (right ventricle and left ventricle) and two atria. The average heart percentage of male Alabio ducks in this study was around 1.50% -2.00%. The maintenance system used was a confined system so that the activities were the same so that the heart's work in pumping blood was not too heavy because it did not do much activity. Factors that can influence heart weight include body size, age, and environmental temperature (Frandson, 1992). The gizzard is an organ that plays an important role in breaking down food particles into smaller pieces so that they are easily digested by poultry. The average percentage of gizzards for male Alabio ducks given wet duckweed and duckweed flour ranged from 3.67% - 4.67% with a rearing time of 10 weeks. According to Tillman et al. (2008) the crude fiber content in feed affects the weight of the gizzard; the higher the crude fiber content, the higher the activity of the gizzard and its weight. Based on observations during the research, the activity of the ducks in each treatment was relatively the same, as were gender, body weight and age, which had an impact on the weight of the gizzard, liver and heart which were relatively the same for each treatment. The metabolic process occurs after feed enters the poultry's body, which then affects the activity of the gizzard, liver, and heart. To be able to digest feed with high fiber, birds increase their metabolism so that this can increase the size of the liver, heart and gizzard.

Conclusion

Duckweed with complete feed has the same results so it can be used as a substitute feed and between the two treatments P1 and P2 it is known that using wet duckweed gives the best percentage of carcass parts.

Acknowledgments
Thanks are expressed to the Institute for Research and Community Service (LPPM ULM) which has funded and facilitated this research activity through the Compulsory Research Lecturer Program (PDWM) so that this research can be carried out.

Author Contributions
Herliani (first author and lead researcher), Danang Biyatmoko, Abrani Sulaiman, Habibah, Puteri Amilia, and the entire team collaborated in designing, conducting, and completing this research.

Funding
Funded by UniversitasLambungMangkurat In accordance with the Budget Implementation List (DIPA) LambungMangkurat University Public Service Agency LambungMangkurat University Fiscal Year 2024 Number: SP DIPA-023.17.2.677518/2024, November 24 2023.

Conflicts of Interest
The author declares that the research is purely the work of the author and team. If anything happens in the future, the author is prepared to be sued in accordance with applicable provisions.

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