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Effectiveness of Feeding Maggot (*Hermetia illucens*) and Biomassa Microalga *Aurantiochytrium* for The Improvement of Joper Chicken (*Gallus dometicus*) Productivity

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Abstract

Maggot and microalgae Aurantiochytrium sp. are known to improve the growth performance of chickens. However, the use of these two components in chicken feed has not been widely reported. Maggot has protein content, while Aurantiochytium microalgae has omega 3 DHA content, both of which are good for growth. This study aims to determine the effectiveness of feeding joper chickens (Gallus dometicus) with maggot (Hermetia illucens) and microalgae Aurantiochytrium. The research location will be conducted at the Green House of Muhammadiyah University Prof. Dr. Hamka. The research was conducted experimentally using a completely randomized design (CRD) with 6 treatments and 4 replications. Treatments P0 (100% rice bran and corn), P1 (maggot 10%, microalgae Aurantiochytrium 1.5%, rice bran & corn 88.5%), P2 (maggot 20%, microalgae Aurantiochytrium 2%, rice bran & corn 78%), P3 (maggot 30%, microalgae Aurantiochytrium 2.5%, rice bran & corn 67, 5%), P4 (maggot 40%, microalgae Aurantiochytrium 3%, rice bran & corn 57%), P5 (maggot 50%, microalgae Aurantiochytrium 3.5%, rice bran & corn 46.5%) The variables observed were body weight and daily weight growth rate of joper chickens. The results showed that the effect of variations in maggot and microalgae Aurantiochytrium concentrations on feed had a significant effect on body weight ($P < 0.05$) and a significant effect ($P < 0.05$) on the daily weight growth rate of joper chickens

Keywords: *Animal feed, Biomass, Growth, Joper chicken, Maggot, Microalgae Aurantiochytrium sp.*

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INTRODUCTION

According to data from the Indonesian Central Bureau of Statistics (2021), the need for chicken consumption decreased by 3.4% due to price increases. Meanwhile, the need for people to consume chicken as a fulfillment of animal protein and omega 3 needs for

the body is increasing, this results in the need for chicken livestock also increasing along with the high demand from the community (Tribudi et al., 2022). One of the increasing demands for chicken is joper chicken (super jowo) which has a very important role as a source of energy to maintain the body, growth and development. Super native chickens have the advantage of growing faster than ordinary native chickens (Fuddin et al., 2022). The nutritional needs of chicken feed also need to be considered, considering that chicken is the most consumed by the Indonesian people, therefore there is a need for renewal in making animal feed as a fulfillment of nutrition in chickens (Nurawaliah et al., 2022).

Alternative chicken feed can use housefly maggot derived from BSF black soldier fly (*Hermetia illucens*), as a source of protein (Kooienga et al., 2020). In addition, the addition of BSF larvae can provide the potential to be a good source of nutrition for laying hens (Mat et al., 2022). Chickens need fatty acids containing omega-3 and DHA (*docosahexaenoic acid*) for their growth (Rini Fahmi et al., 2009). Omega-3 and Omega-6 in high enough amounts. According to Hasyim (2016), 100 g of microalgae contains Omega-3 fatty acids ranging from 128-1629 mg and Omega-6 fatty acids ranging from 188- 1704 mg (Hasyim et al., 2016). Both of these fatty acids are important for the body, especially as the formation of brain tissue membranes, nerves, eye retina, blood plasma and reproductive organs. Omega-3 fatty acids are considered essential fatty acids. This means that these fatty acids are essential for the body's health but cannot be made by the body itself. Therefore, omega-3 fatty acids must be obtained from the diet, especially from fish and certain vegetable oils.

Saturated fatty acids containing omega-3 and DHA (*Docosahexaenoic Acid*) can be obtained from the microalgae *Aurantiochytrium* (Russo et al., 2022) because in addition to containing omega-3 and DHA, *Aurantiochytrium* also contains *squalene* and *astaxanthin*. Maggot which already has protein content added with *Auranthiochytrium* microalgae for chicken feed can provide a booster effect for joper chickens as a fulfillment of growth and development nutrition. According to experts, the human body needs about 300 mg of omega-3 per day, so when joper chickens fed with maggot and Aurantiochytrium are consumed by humans, they can get more protein, omega-3, and DHA intake (Suhendra et al., 2019).

METHOD

Materials and Tools

The materials used include fatty liver samples of joper chickens obtained from maggot feed test chickens and *Aurantiochytrium* microlaga with a complete randomized design experiment, casein, distilled water, concentrated sulfuric acid p.a, NaoH 40% p.a, catalysts in the form of CuSO4 and K2SO4 (1: 2), Mix indicator, pp indicator, 0.1 N HCl and 0.1 N boracic acid p.a. The tools needed include a 100 mL Kjeldahl flask, a set of distillation tools and a 10 ml burette, a 100 ml erlenmeyer, a 100 ml measuring cup, and a drop pipette.

Chicken Liver Protein Testing

The Destruction stage is carried out by weighing a sample of 0.5 grams which has been mashed and then put into a 100 ml Kjeldahl flask which is then added 10 ml of concentrated sulfuric acid and a catalyst of approximately 1 gram. The Kjeldahl flask is heated on a deconstruction stove at 2700C for 2 hours or when the color of the solution becomes clear greenish (AOAC, 2005).

The deconstruction tube was then cooled and adjusted the volume with distilled water to 50 mL. A total of 20 mL of liquid was taken and put into the distillation flask then 20 mL of 40% NaOH was added carefully through the wall. The pp indicator was added as much as 3 drops. Blanko was made by replacing the sample with distilled water as a deduction. The distillation flask was attached to the device and the condenser was turned on and the tip was immersed in the holding liquid. Erlenmeyer containing 20 mL of 0.1N borax acid solution to which 3 drops of methyl red indicator had been added was used as a container for distillation results (AOAC, 2005). The distillate liquid was collected according to the treatment duration of 5, 7 and 10 minutes.

Samples and blanks of distillate were then titrated using 0.1 N HCl solution. The titration process ended until the color of the solution in Erlenmeyer changed from light green to light purple, indicating that all N elements reacted with Cl (AOAC, 2005). Each treatment was repeated 3 times.

Data Analysis

$$\text{Protein Content} = \left(\frac{\text{V1}-\text{V2} \times \text{N} \times 0{,}014 \times \text{fk} \times \text{fp}}{\text{W}}\right) \times 100\%$$

Description :

W (example)	= snippet weight (g)
V1	= HCl 0,1 N Volume used in the determination of the sample (mL)
V2	= HCl 0,1 N Volume used in the blanks
N (HCl)	= HCl Normality
fk	= conversion factor for protein from food in general = 6.25; milk and dairy products = 6.38; butter and nuts = 5.46
fp	= dilution factor

RESULTS AND DISCUSSION

Parameter Test

Chicken weight gain show differences in different increases (based on the table 1), the highest final weight gain in P5 with an average gain of 839.375 grams; followed by the second highest with P4 at 605.625 grams; then the third highest in P1 with 581.563 grams; then followed by the last three namely P3 with 578.438 grams; P2 with 553.125 grams; and P0 327.813 grams. The results of the data analysis can be concluded that there are differences in the average weight gain in each treatment. This is caused by a decrease in consumption in chickens along with the increase in energy and protein content in feed (Anggraini et al., 2019). This is also in line with the statement of Muharlien et al. (2020) who said that the protein content of the feed greatly affects the amount of feed consumed

by chickens. Because protein is a limiting factor for chicken consumption other than energy, it affects chicken weight gain (Dabbou et al., 2018). This happens because the amount of protein consumption helps the body's protein synthesis process (Sulabda, 2021). In addition, Mudarsep et al. (2021) stated that the significant increase in body weight gain of chickens receiving amino acid treatment from BSF maggot was due to the content of lysine and methionine in the solution. *Lysine* and *methionine*, as essential amino acids, have an important role in accelerating chicken muscle growth, which in turn increases overall body weight. Based on the measurement of chicken weight per week, the following results were obtained

Table 1. Chicken Weight

Chicken Weight (gr)						
Treatment	**W1**	**W2**	**W3**	**W4**	**Total**	**Average**
P0	275	302,5	336,25	397,5	1311,25	327,8125
P1	436,25	522,5	620	747,5	2326,25	581,5625
P2	391,25	498,75	621,25	701,25	2212,5	553,125
P3	462,5	557,5	630	663,75	2313,75	578,4375
P4	451,25	536,25	653,75	781,25	2422,5	605,625
P5	660	811,25	890	996,25	3357,5	839,375

Meanwhile, the results of protein analysis in the liver of factory-fed and treated chickens are shown in the following table.

Table 1. GC-MS test results of protein content in chicken liver

P0

Parameter*	Result	Unit	Method
Protein content	16.62	%w/w	IK.LP-04.5-LT-1.0

P5

Parameter*	Result	Unit	Method
Protein content	18.19	%w/w	IK.LP-04.5-LT-1.0

Based on the results of observations that have been made for 35 days, the results of protein nutrient content are different for each treatment. The highest nutrient content was obtained in treatment P5 (Maggot 50%, Microalgae *Aurantiochytrium* sp. 3.5%, factory feed 46.5%) with protein content reaching 18.19%. Protein in the P5 treatment increased by 1.57% when compared to P0 (100% factory feed) which only contained 16.62%. The different protein content is caused by several things, namely feed consumption, type of feed and the nutritional content of the feed given. This is in line with the statement of Hidayat et al.(2011), namely the need for protein is influenced by the amount of food consumed, the higher the protein content, the more efficient the utilization of food needed.

CONCLUSION

The conclusion that can be obtained from this study is that feeding BSF maggot fly larvae (*Hermetia illucens*) and *Aurantiochytrium* microalgae biomass in the P5 treatment is the best level in increasing the protein content contained in chicken liver.

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