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Giving Maggot (Hermetia Illucens) Using Household Waste Media in Food to The Analysis of Broiler Chicken Earnings

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ABSTRACT

The purpose of this study was to determine the potential of giving maggot with live media of household waste as feed on broiler chicken business analysis to determine production costs, profit and loss analysis, R / C ratio analysis, and income over feed cost (IOFC). The hypothesis of this study is the provision of maggot with live media of household waste as feed has a positive effect on broiler chicken business analysis to determine production costs, profit and loss analysis, R / C ratio analysis, and income over feed cost (IOFC). The materials used in the study were maggot flour from household waste media, 100 broiler chickens aged 0-4 weeks, commercial feed, basal feed consisting of corn, coconut meal, rice bran, soybean meal, fish meal, top mix and oil. The research basal feed in the starter phase was prepared with 3100 kcal/kg metabolic energy (EM) and 21% crude protein, and the finisher phase was prepared with 3200 kcal/kg metabolic energy (EM) and 19% crude protein. This research is an experimental study that uses a non-factorial completely randomised design (CRD) consisting of 6 treatments and 4 replicates as follows: P0: control 1 (chicken fed commercial feed), P1: control 2 (basal feed), P2: basal ration + maggot feeding along with 10% medium, P3: basal ration + maggot feeding along with 20% medium, P4: basal ration + maggot feeding along with 30% medium. Parameters observed included production costs, profit/loss analysis, R/C ratio analysis and income over feed cost. The results of the research that have been obtained are the provision of maggot flour along with media from household waste using up to 30%, namely in treatment P4 can increase profits, increase R / C ratio, increase IOFC, and reduce production costs. Feeding maggot flour along with media from household waste up to 30% use has a positive effect on broiler chickens in the starter and finisher periods.

Keywords: *broiler chicken, maggot, and business analysis*

INTRODUCTION

As the population grows and awareness of food nutrition increases, the demand for broiler meat to fulfil people's protein needs is also increasing. Therefore, broiler farming is one of the interesting potentials to be developed in Indonesia, especially in rural areas (Siregar, 2018).

One of the important supporting factors in broiler farming is quality feed. Quality feed must contain sufficient nutrients, especially protein. However, the price of poultry feed, especially fishmeal, continues to increase due to the high price of raw materials for animal protein sources such as fishmeal, which is often adulterated and fluctuates in availability. The impact of this increase in fishmeal prices is an increase in feed prices and farm production costs.

To overcome this problem, it is necessary to find alternatives to fishmeal that are more affordable but still of good quality. One unconventional ration ingredient that has the potential to be used as a substitute for fishmeal is maggot (Hermetia illucens) (Siregar et al., 2022a). Maggot can be

obtained from processing household waste, especially withered vegetables or fruits, as a growth medium for Black Soldier Fly (BSF) larvae (Siregar et al., 2022b).

Maggot or Black Soldier Fly (BSF) larvae have a protein content between 40-50% and fat content ranging from 29-32%, making them a potential source of protein for use as broiler feed. The quality and success of maggot production is greatly influenced by the growing medium, as the Hermetia illucens fly species likes a distinctive media aroma.

By utilizing maggot from household waste as a substitute for fishmeal in broiler feed formulas, it is expected to reduce production costs and increase farmers' profits. Therefore, it is necessary to conduct research on the provision of maggot flour with live media from household waste in the ration to analyze the broiler farming business. Analyses that need to be done include production costs, profit and loss analysis, R/C ratio analysis, and income over feed cost (IOFC).

Thus, the use of maggot as broiler feed is an attractive alternative in animal husbandry, because in addition to meeting the animal protein needs of the community, it can also help overcome the problem of high feed prices and increase farmers' profits.

METHOD

Place and Time of Research

This research was conducted at Jalan Nusa Indah Gg Bulan Kompleks GIM No b 25 in April to June 2023.

Materials and Research Tools

The materials used were maggot flour from household waste media, 100 broiler chickens aged 0-4 weeks, commercial feed, basal feed consisting of corn, coconut meal, rice bran, soya meal, fish meal, top mix and oil. The research basal feed in the starter phase was prepared with 3100 kcal/kg metabolic energy (EM) and 21% crude protein, and the finisher phase was prepared with 3200 kcal/kg metabolic energy (EM) and 19% crude protein. The tools used were litter cages each containing 5 broiler chickens, digital temperature, "digital" scales of 100 g, 200 g, 500 g and 10 kg capacity, plastic sizes of 1 kg, 10 kg and 50 kg, stirring rods, sieves, trays, measuring tapes and knives.

RESEARCH METHODS

The experimental design used in this study was a non-factorial complete randomised design (CRD) with 5 treatments and 4 replications (5 heads per replication plot). The scope of this study focused on observing the use of maggot and its living media, namely from household waste. The treatments given were as follows:

P0: control 1 (commercial feed)
P1: control 2 (basal feed)
P2: basal feed + maggot feeding along with the medium 10%
P3: basal feed + maggot feeding along with the medium 20%
P4: basal feed + maggot feeding along with the medium 30%

The replicates obtained are derived from the formula:

$t\ (n-1) \geq 15$
$5\ (n-5) \geq 15$
$n \geq 4$ (Repeat).

Data Analysis

Data from the study will be analysed using a completely randomised design with the linear method as follows:

$Yij = \mu + \tau i + \varepsilon ij$

Description :
Yij = Observation result of the effect of i-th yakult treatment and j-th replication
μ = General mean value
τi = Effect of i-th feed treatment
εij = Experimental error due to i-th feed treatment and j-th replication
i = (1,2,3,4,5)
j = (1,2,3,4)

The research data were analysed by analysis of variance and if there are real and very real differences, it will be continued with a real difference test according to the value of the kerangaman coefficient (Steel and Torrie, 1980).

Research Implementation

Cage Preparation

Cage preparation consisted of cleaning the cage, making cage plots, sanitising the cage, sowing husks on the bottom of the cage, installing heating lamps and fumigating the cage. Furthermore, 5 broiler chickens were placed in each of 20 cages (5 treatments x 4 replicates) experimental units equipped with feed and drink containers.

Treatment Phase

The research was conducted in two stages, namely the preliminary stage and the treatment stage. The preliminary stage is making maggot flour from household waste media and analysing nutrients (proximate analysis). Before making maggot flour from household waste media, the first step taken is the maintenance and cultivation of maggot with its media. As for the method, the preparation starts with the purchase of 30 grams of BSF maggot eggs, then we hatch maggot eggs using rice bran media that has been fermented first for approximately 3 days after the maggot eggs hatch, the baby maggot is transferred to each household waste media with prepared tofu pulp food ingredients. After that maggot can be harvested at the age of 10 days. After the maggot is harvested along with the media, the maggot is dried in an oven/heater at +60oC. After drying, it is then blended to make it smooth. Maggot flour that has been mashed is stored in a dry place. Then weighed according to the needs of broiler livestock and mixed in feed.

The treatment stage begins with cage preparation consisting of cage cleaning, making cage plots, liming the cage, sanitising the cage, sowing husks, installing heating lamps and fumigating the cage. Furthermore, 5 broiler chickens were placed in each experimental unit equipped with feed and drinking places.

The treatment was carried out when the chickens were 0-4 weeks old. Newly arrived broiler DOCs were adapted first before treatment. 100 broilers were placed in 20 experimental cages. Broilers were randomly divided into 5 treatments with 4 replicates, where each replicate consisted of 5 broilers. In the study, broilers will be treated with commercial feed, basal feed (in table 1) and maggot flour added and drinking water is given adlibitum.

Feeding treatment is done when broiler chickens aged 0 - 4 weeks according to each treatment given in the morning. P0 treatment feed with GF 511 Japfa Comfeed Starter chick feed in the starter phase. Then given the P0 treatment feed with GF 512 Japfa Comfeed finisher broiler feed in the finisher phase.

Table 1. Formulation of Starter Phase Treatment Feed

No	Ingredients	Treatment			
		P1	P2	P3	P4
1	Maize	49,5	48	45	41
2	Coconut meal	15	15	12	10
3	Rice Bran	5	4	4	4
4	Soybean Meal	16,5	18	14	10
5	fishmeal	10	0	0	0
7	maggot meal and media	0	10	20	30
8	Oil	2	3	3	3
9	Top Mix	2	2	2	2
Total		100	100	100	100
Gross Energy (kkal)		3.100	3.107	3.105	3.109
Crude protein (%)		21,05	21,14	21,10	21,37

Source: Sahabat Ternak (2022).

Table 2. Finisher phase treatment feed formulation

No	Ingredients	Treatment			
		P1	P2	P3	P4
1	Maize	53	53	50	44
2	Coconut meal	16,5	15	10	8
3	Rice Bran	5	4	4	2
4	Soybean Meal	10,5	12,5	10,5	10,5
5	fishmeal	10	0	0	0
7	maggot meal and media	0	10	20	30

8	Oil	3	3,5	3,5	3,5
9	Top Mix	2	2	2	2
Total		100	100	100	100
Gross Energy (kkal)		3.211	3.214	3.230	3.239
Crude protein (%)		19,11	19,29	19,12	19,13

Source: Sahabat Ternak (2022).

Weighing the remaining feed was done once a day in the morning, while weighing body weight was done once a week. Data on digestibility, production cost, profit/loss analysis, R/C ratio analysis and income over feed cost were collected when broilers were 4 weeks old.

Observed Parameters

In this study the parameters observed were:

1. Production cost (total cost) is the addition of fixed costs and variable costs. Production costs are calculated based on the formula.

TC =FC+VC

Description: TC = Total Cost
FC = Fixed Cost
VC = Variable Cost / Variable Cost

2. Profit/Loss Analysis (Profit-Loss) profit analysis is calculated based on the formula

Description: TR: Total Revenue
TC: Total Cost

3. Analysis of the R/C Ratio (Revenue Cost Ratio) is a comparison between (Revenue) and costs (Cost) that have been calculated at their present value. According to Soekartawi (2003), R/C ratio is the ratio between revenue and cost. The calculation of the R/C ratio is done with the formula according to (Gittinger, 1996) as follows.

R/C Ratio = TR/TC

Description: R/C: Revenue and Cost Scales
TR: Total Revenue
TC: Total Cost

Decision-making criteria based on the R/C value obtained if the net R/C ratio value> 1 indicates that the business is feasible to implement while if the value is < 1 then the business activity is not feasible to continue.

4. Income Over Feed Cost (IOFC) is one way to determine the cost efficiency obtained from the sale of production minus the cost of rations regardless of other costs that have not been taken into account such as labour wages, cage rent, seeds and so on that are not included in variable costs which are formulated as follows:

IOFC = (Income - ration consumption cost).

RESULTS AND DISCUSSION

Table 3 showed that the treatments did not significant effect on economic analyzing of broiler chickens.

Table 3. Average of Production Cost, Profit/Loss Analysis, R/C Ratio and Income Over Feed Cost (IOFC)

Treatments	Production cost (Rp)	Profit/loss analysis (Rp)	R/C ratio (%)	IOFC (Rp)
P0	41.500^{A}	2.947^{A}	$1,07^{A}$	4.447^{A}
P1	31.967^{B}	11.092^{B}	$1,35^{B}$	12.592^{B}
P2	30.583^{C}	11.360^{C}	$1,37^{C}$	12.860^{C}
P3	30.144^{D}	12.675^{D}	$1,42^{D}$	14.175^{D}
P4	29.729^{E}	13.903^{E}	$1,47^{E}$	15.403^{E}

Means with different superscripts in the same column the difference is very significant ($p<0.01$).

DISCUSSION

Production Costs, Profit/Loss Analysis, R/C Ratio Analysis and IOFC

Production costs can be defined as all expenditures made by a business to obtain factors of production and raw materials that will be used to create the goods it produces.

Production costs in a business consist of fixed costs and variable costs. The results of the analysis of variance showed that the provision of maggot flour along with media from household waste up to 30% use as a substitute for commercial feed and basal feed differed significantly on production

costs. The highest production costs were found in the P0 treatment with a value of Rp 41,500, while the lowest production costs were found in the P4 treatment with a value of Rp 29,729. This is due to differences in variable costs that differ in each treatment due to the price of feed and how much feed is consumed. The price of feed is different for each treatment due to differences in the percentage of maggot flour and media from household waste in feed which is relatively cheaper than fishmeal. The price of feed greatly affects the cost of feed which is a non-fixed cost.

One of the reasons for high non-fixed costs is the high cost of feed. Feed costs are considered the most important and largest factor in production costs because 80% of the costs incurred by a farmer are used to purchase feed. This opinion is supported by the opinion of Anindyasari et al, (2015) which states that the largest cost in production costs is the cost of feed. This opinion is also in accordance with Tarigan and Manalu (2019), which state that in the livestock business, the cost of rations is the largest production cost, where the cost of rations reaches 60-70% of all production costs.

Production costs cannot be separated from the production process because production costs are inputs or inputs multiplied by their prices. Thus it can be said that production costs are all expenses or all expenses that must be borne by the company to produce a type of goods or services that are ready for consumers to use. This is in line with the opinion of Fitalokasari (2017) that production costs are all expenses or all expenses that must be borne by the company to produce a type of goods or services that are ready for consumers to use.

Profit and loss analysis describes the profit earned in a period obtained by reducing all revenues and costs incurred during a certain period. The amount of profit or loss will be known from the difference between income and expenditure. The results of the analysis of variance showed that the provision of maggot flour along with media from household waste using up to 30% as a substitute for commercial feed and basal feed was significantly different from the profit-loss analysis. The highest profit was in the P4 treatment which was Rp 13,903, - then followed by the P3 treatment which was Rp 12,675, - then followed by the P2 treatment which was Rp 11,360, - then followed by the P1 treatment which was Rp 11,092, - then followed by the treatment and the smallest profit average value was in the P0 treatment which was Rp 2,947, -.

The price of profit difference is influenced by the selling price of boiler chickens per head in each treatment because the selling price is not the same where the price is according to the final body weight. The difference in profit can be seen where the greater the profit value in line with the increasing concentration of maggot flour and media from household waste in the treatment is due to the price of maggot flour and media from household waste is cheaper than commercial feed and basal feed so that feed costs are smaller and automatically smaller production costs incurred. This opinion is supported by the opinion of Umar (2003) that production costs affect profit and loss analysis. Another opinion was expressed by Anindyasari et al, (2015) which stated that farm income is the multiplication of production obtained by the selling price.

R/C ratio is the ratio between sales revenue and costs incurred during the production process to produce products. The purpose of calculating the R/C ratio analysis is so that the efficiency of inputs and outputs can be measured, the way that can be taken is to compare the total production costs incurred with the revenue obtained.

The number of benefits and additional revenue obtained in every one rupiah that must be spent every time the production process runs is called the R/C ratio analysis. The results of the analysis of variance showed that the provision of maggot flour along with media from household waste using up to 20% as a substitute for commercial feed and basal feed was not

significantly different from the R/C ratio analysis. The largest R/C ratio was found in the P4 treatment of 1.47; then followed by the P3 treatment of 1.42; then in the P2 treatment of 1.37; then followed by the P1 treatment of 1.35; and the smallest R/C ratio was found in the P0 treatment of 1.07. These results indicate that broiler chickens fed with maggot flour treatment along with media from household waste are feasible to be used as a business, because the R/C ratio obtained is greater than one. This opinion is supported by the statement of Murti et al, (2020) that the higher the ratio of business obtained in the livestock business, the more efficient the business, if the R / C ratio obtained is more than one, it means that the business is profitable. If the ratio value> 1 then a business is said to be efficient, so it can be explained that the value of the R / C ratio increases, the return received by farmers in every one rupiah will automatically increase as well. If the R / C < 1 then the business is not efficient, meaning that farmers experience losses. The revenue earned by farmers will be smaller than the total costs that must be incurred in each production period (Soekartawi, 2006).

The above opinion is in line with Mulyadi's opinion (2001) if the R / C Ratio> 1 then the business is worth continuing while the R / C Ratio < 1 then the business is not worth continuing. According to Yosefa (2018) R/C value > 1 means that farmers have been able to produce an ideal ratio to produce a profitable business, because the value of revenue is still above the value of costs incurred in livestock business per period. The results of the analysis of the calculation of the R.C ratio are greater, the greater the profit obtained by farmers who run their business.

Income over feed cost (IOFC) is the income obtained from the difference between the sales revenue per head and the average cost of feed consumed per head during the study. The results of the analysis of variance showed that the provision of maggot flour along with media from household waste up to 20% as a substitute for commercial feed and basal feed was not significantly different from income over feed cost (IOFC). The largest IOFC was found in the P4 treatment of Rp 15,403, - then followed by the P3 treatment of Rp 14,175, - then followed by the P2 treatment of Rp 12,860, - then followed by the P1 treatment of Rp 12,592, - then the smallest IOFC was found in the P0 treatment of Rp 4,447. It can be seen that the IOFC is getting bigger as the concentration of maggot flour and media from household waste increases in the treatment. This is because the price of P4 feed is cheaper than P0 and other treatments because maggot flour and media from household waste are relatively cheaper than commercial feed and basal feed. The lower the feed cost, the higher the IOFC produced because one of the things that affects IOFC is feed cost.

This opinion is in accordance with the statement of Nuningtyas (2014) which states that income over feed cost is influenced by feed consumption, body weight gain, feed costs and selling prices. This is in accordance with the statement of Sugiarti et al, (2021) that IOFC is obtained by calculating the difference between total revenue and total feed costs used during the study.

CONCLUSION

Providing maggot flour along with media from household waste use up to 30%, namely in the P4 treatment can increase profits, increase the R/C ratio, increase IOFC, and reduce production costs.

Declaration by Authors

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