

Performance production of grower native chickens fed with phytobiotics and maggot-based feed

Dinda Dwisyahfani, Gilang Ayuningtyas*, Bagus Priyo Purwanto, Danang Priyambodo, and Pria Sembada

Livestock Management and Technology, Vocational School of IPB Kumbang Street, Babakan, Center Bogor District, Bogor City West Java, 16128

Abstract. This study aimed to investigate the effects of phytobiotics in drinking water on the production performance of native chickens. The research used a completely randomized design with 3 treatments. A total of 3000 six-week-old native chickens were randomly allocated to 3 drinking program treatments as follows: regular drinking program as control (T0), drink water mixed with powdered turmeric extract (T1), drink water mixed with powdered turmeric extract combined commercial probiotic (T2), each treatment had 2 replicates. Commercial probiotic and powdered turmeric extract were given in the morning until afternoon, then the remaining drinking water was measured. The feed given came from Magnesia of Vocational school IPB which applied as point feed. The variables that observed were feed consumption, drinkin' consumption, body weight, weight gain, feed conversion ratio, and mortality. We used ANOVA analysis and followed by Tukey Test. Treatment P2 (Tumeric extract combined commercial probiotic) is significantly different and had better results than the other treatments in several variables that observed. It also had the highest average in body weight and body weight gain. Phytobiotics can be used by everyone because the ingredients are easy to find, and had good effect for carcasses.

1 Introduction

Local chickens in Indonesia are very diverse, and most local chickens are named according to the area of their origin. In addition to the name of their morphological characteristics, they also depend on the area. There are several things which are important factors in animal husbandry. One of them is the cost of 70-80% from feed. In the case of making animal feed, it must be of good quality and sufficient quantity. Indonesia is still dependent on raw materials, which requires the import of raw materials such as MBM (meat bone meal), and fishmeal [1]. In overcoming this problem, namely by replacing protein source raw materials using BSF maggot. Black Soldier Fly (BSF) or Maggot BSF is an insect which have high protein. Through innovation, BSF maggot is processed into maggot flour with a content of 49.67% and fat 29.65% [2]. The difficulty of getting quality breeds is also a problem in rearing native chickens as it affects to the animal's health and productivity. Since 2017, the Indonesian government has strictly forbidden using antibiotics as AGP in poultry feed, therefore, it is necessary to have alternatives as a substitute for antibiotics. One of them is using phytobiotics which have a good effect on poultry products because they did not leave antibiotic residues so they are safe for consumption. It also doesn't cause environmental contamination. Phytobiotics have become an approved and worth commercially alternative for poultry production [3]. Phytobiotics have a positive impact on native chickens, such as increased metabolism, residue-free and disease resistance. Therefore, using phytobiotics can increase the production and carcass quality of native chickens because the affect of consuming it can produced bigger carcass. Probiotic feeding in poultry can be used to reduce or prevent disease-causing microbial contamination of poultry products (pathogenic microbes) to poultry products so that the products produced remain hygienic.

There are many innovations that can be used to replace these antibiotics, one of which is the administration of phytobiotics through drinking water. The role of water and phytobiotics is a good combination because water is important for digesting food and absorbing nutrients. Chickens will not survive without drinking water even for a few days. Phytobiotics are herbal ingredients derived from plants that are safe to use on poultry. Turmeric is one of the phytobiotic plants that contains curcumin which can increase poultry appetite and facilitate digestion. Turmeric extract, a type of phytobiotic, contains curcumin which has antioxidant, anti-inflammatory and antimicrobial properties. Phytobiotics have a positive impact on local chickens, that are increased metabolism, residue-free chicken meat and more resistance to disease. Phytobiotics provide health benefit, enhance growth and increase meat and egg quality in livestock production [4]. Commercial probiotics such as commercial probiotic can also be used as natural antibiotics because they contain lactic acid bacteria such as *Lactobacillus casei* which can increase feed efficiency and to prevent disease in a few time.

*Corresponding Author: gilang_a@apps.ipb.ac.id

This research meant to investigate the performance production of native chickens given phytobiotics through their drinking water.

2 Method

The research was conducted from August until November 2023 located in, Kodir farm, Bojong Galing, Bojong Genteng District, Sukabumi.

2.1 Material

This research were used 3000 native chickens type Ayam Kampung Asli (AKA) without separating sex (unsex). AKA chickens are reared starting from the day old chick until 10 weeks. Start from 6 weeks of age or have entered the grower period the chicken will be given the treatment of the supplementation of phytobiotics turmeric extract through drinking water. The phytobiotic used is powdered turmeric extract, and the probiotic uses a commercial mixture of microorganisms (EM-4), namely *Actinomyces Sp*, *Streptomyces SP* and *Yeas (Lactobacillus Sp)*, *Photocentetic Bacteria (Rhodopseudomonas Sp)*, and cellulose-decomposing fungi [5]. The feed used during the research its own feed from Magnesia Vocational School IPB, which was substituted from 7% maggot flour. The proximate analysis of this research can be found in Table 1.

The equipment were used include open cages with 3000 capacity, buckets, measuring cups, scales, thermometers, and lamps.

Table 1. Nutritional contents of experimental rations

Nutrient	Unit	Content Value
Water Level	%	9.535 ± 0.19
Protein Level	%	22.91 ± 0.51
Total Fat	%	7.64 ± 0.17
Total Energy	(kcal/100gr)	366.46 ± 0.93
Ash Level	%	8.4 ± 0.21
Carbohydrate	%	51.515 ± 0.51

2.2 Research procedure

The research preparations began by preparing phytobiotics (turmeric extract powder and commercial probiotic EM-4) the application started from 6 AM until 1 PM. And then the leftover water was measured and followed by giving water (nontreatment). Feeding method in this research is using point feed with feeding frequency of 2 times a day and the form is mash. The variables observed in this research are feed and drink consumption, body weight gain, average body weight, FCR (feed consumption ratio), and mortality. The temperature of the environment here ranges from 27-28 celcius with humidity 70-71%. But it can also unpredictable, so we always checked and make sure all chickens are fine.

2.3 Data analysis

This study used a Randomised Complete Design (CRD) with three (3) treatment levels, each treatment consisting of two (2) replicates to see the production performance of grower period chickens starting at age 6 to 10 weeks of age. Each replicate consisted of 455 native chickens. The treatments are as follows, P0: Control or without any addition of phytobiotics. P1= Addition of powdered turmeric to drinking water on Monday, Wednesday and Friday, P2= Addition of powdered turmeric to drinking water on Monday, Wednesday, Friday and probiotics on Tuesday, Thursday and Saturday. The dose of turmeric extract used in each treatment is 0.5g/L drinking water, while the probiotic dose is 1ml/L water.

The data data were collected will be presented in a table and then analyzed using the General Linear Model (GLM) analysis of variance to determine the effect of the treatment on the observed variables. If it shows significant differences, it is continued with multiple comparison tests, namely the Tukey test. The linear model for a completely randomized design (CRD) is as follows:

$$Y_{ij} = \mu + \tau_i + \epsilon_{ij}$$

Description:

Y_{ij} = observation in treatment I (1,2,3) replications j (1,2)

μ = General average

τ_i = Effect of i (1,2,3)

ϵ_{ij} = Random effect in treatment I (1,2,3), replication j (1,2,3)

3 Result and discussion

3.1 Average of feed consumptions

Feed intake or usually known as feed consumption can be obtained from the calculation between the difference between feeding and the remaining feed that is not consumed by chicken. Average of Feed Consumptions on growth period until AKA chickens are harvested (6-10 weeks) in Table 2.

Table 2. Average of Feed Consumption gram per head per weeks

Weeks	T0	T1	P2
6	298.01 ± 0	298.01 ± 0	298.01 ± 0
7	339.95 ± 0	339.95 ± 0	339.95 ± 0
8	412.87 ± 0	412.87 ± 0	412.87 ± 0
9	473.18 ± 0	473.18 ± 0	473.18 ± 0
10	520.46 ± 0	520.46 ± 0	520.46 ± 0

Description of P-Value > 0.05 P0: Control or without any addition of phytobiotics, P1= Addition of powdered turmeric extract to drinking water on Monday, Wednesday and Friday, P2= Addition of powdered turmeric extract to drinking water on Monday, Wednesday, Friday and probiotics on Tuesday, Thursday and Saturday.

According on the results of the research, the supplementation of tumeric extract and probiotics on drinking water didn't significantly different ($P > 0.05$) on feed consumption. This shows that supplementation of turmeric and probiotic in drinking water still has the similar effects on feed consumption even though they are used for 5 weeks (6-10 weeks of age), and this indicates that the research treatment had no effect on the taste of the feed and appetite of these AKA chickens. No significantly different effect maybe since the chickens were fed the same feed with the appropriate protein and energy content. In line with Sinurat et al, (2009) [6], that turmeric does not cause changes in feed consumption in the treatment. Giving turmeric flour doesn't have a significantly effect, because the content of turmeric is low in protein, about 6.3%. Sari et al, (2015) [7] reported that fermentation herbs can be use in different times spans didn't show significant differences in feed consumption. Although the condition of probiotics with turmeric flour can synergize to increase appetite. But the other side it only reduce abdominal fat and emptying of stomach.

3.2 Average of drink consumptions

Drinking consumption is the results of giving water minus the leftover water. In this study, drinking water consumption was measured at 13:00. The application of phytobiotics showed a significant effect ($p < 0.05$) on the drinking consumption of AKA chickens, as can be seen in the table 2.

Table 3. Average of drink consumptions (liter per head per weeks)

Weeks	P0	P1	P2
6	1.153 ± 0.005	1.152 ± 0.004	1.151 ± 0.001
7	1.402 ± 0.006	1.395 ± 0.006	1.389 ± 0.003
8	1.489 ± 0.018 ^a	1.490 ± 0.0170 ^a	1.465 ± 0.0007 ^b
9	1.581 ± 0.019	1.580 ± 0.0219	1.557 ± 0.000
10	1.583 ± 0.045	1.567 ± 0.0007	1.564 ± 0.000

The results of this research showed that turmeric supplement (P1) have same effect on drink consumption 6-10 age of week of AKA Chicken, but P2 yang different effect on water consumption in 8 week of age, with the lowest water consumption compere to other treatment on the same age. Many factors affect the consumption of drinking water in livestock, like water smell, water flavor, supplementary food additives, water temperature, disease, humidity, breeze, feed material, age, sex ratio and where the drink holder is placed. Commercial probiotic is a product containing small organisms that are beneficial to poultry in the decomposition, nutrition, poultry and human health. High environmental temperatures will cause heat buildup in the body so chickens will be heat stressed. Several efforts are made to reduce the heat stress, including reducing ration consumption, increasing heat expenses through the mouth (panting) and this process requires a lot of energy and increasing drinking water consumption. Giving Comerciall Probiotics through drinking water can be alternative feed additive to minimize the negative effects of HS in chicken industry [8]. States that in general, chickens consume 2 times more drinking water than feed consumed because drinking water serves as a solvent and means of transportation of food substances to be distributed throughout the body so that more water is needed than the food. From the two factors above, the characteristics of chickens have sensors that are quite happy with color, therefore chickens tend to be more inclined to drink.

3.3 Average of body weight

Body weight is a factor in the success of raising native chickens, because body weight is influenced by both the quantity and quantity of feed consumed by livestock. Body weight gain is defined as the increase in the shape and weight of tissues

such as muscle, bone, heart and all other body tissues. Weighting is retrieved from 10% of the total number of chickens. The average of AKA body weight reported in Table 4.

Table 4. Average of body weight (gram per head per week)

Weeks	T0	T1	T2
6	379.65 ± 23.264	359.05 ± 8.634	374.30 ± 14.001
7	479.45 ± 7.283 ^a	442.55 ± 9.970 ^b	453.75 ± 4.596 ^{ab}
8	583.03 ± 31.113	568.08 ± 13.010	604.05 ± 2.121
9	637.85 ± 24.395	620.45 ± 17.183	620.75 ± 1.202
10	724.00 ± 22.628	750.05 ± 16.678	799.05 ± 17.678

The average body weight of AKA chickens according to the results ANOVA showed a significant effect ($P < 0.05$) on body weight in week 7. The highest average body weight is P0 or control with an average of 479.45 gram/head while the lowest average body weight is P1 (442.55 gram/head). The content of *Saccharomyces cereviceae* in commercial probiotic can produce amylase enzymes that can increase meat production and also produce proteolytic enzymes, so the activity of breaking down proteins in the digestive tract increases as well [9]. This may occur because the form of mash feed is smooth so that the energy used to consume feed is greater than the energy used for production, and also indirectly impact productivity and yields of itself [10]. From the results of research by Marzuki, (2018) [11], it can be explained that feed in mash or crumble form will both be consumed continuously to meet the needs of chicken life, at least it will be used only for chicken viability. However, the overall body weight in the results of P2 group treatment has the highest average reaching 799.02 g/head in 10 weeks of age, because the provision of phytobiotics is able to provide a symbiotic outgrowth on livestock, the more immense chicken weight will impact the weight of the carcass. Because of probiotic and curcumin extract are natural antibiotics so it safe for human and livestock. Applying curcuma to chickens feed or drinking water can increase their intake and in turn, increase their body weight. BSF maggot contains nutritions that can enhance the quality of meat like acids, fatty, and amino acids[12].

3.4 Average body weight gain

The highest body weight growth is P2 (addition of powdered turmeric extract and commercial probiotic) with an average value of 178.75 g/head/week, for the lowest value is in the P2 treatment with an average value of 16.25 g/head/week in week 9 in Table 5.

Table 5. Average body weight gain

Weeks	P0	P1	P2
6	105.925 ± 20.82	113.205 ± 2.398	139.30 ± 20.86
7	99.80 ± 30.54	83.54 ± 1.33	79.45 ± 18.59
8	103.85 ± 38.39	125.45 ± 3.040	150.75 ± 6.718
9	54.55 ± 55.50	52.45 ± 4.171	16.25 ± 3.323
10	86.15 ± 1.76 ^b	130.05 ± 0.919 ^b	178.75 ± 18.88 ^a
Average:	98.89 ± 26.86	100.94 ± 32.60	112.90 ± 65.04

Body weight gain in AKA chickens did not comply with the standard of PBB because the provision of turmeric extract is more likely to reduce fat content. It should also be considered regarding the physical form of the feed given because it has an impact on the consumption and efficiency of the feed [13] Because the mash feed is smooth, the energy expended to consume feed is more than the energy used for production. Feed that is not fine (relatively large particle size), especially maggot and corn, is more easily selected by livestock, so it affects the consumption of chicken nutrients. Courtesy of Panjaitan et al. [13] bestest type of feed for the starter period is mash, while the feed for the finisher period should be pellets with the right density and nutritional content. However, these two factors are not the only factors, because the non-achievement of weight gain can be suspected due to the quality of the feed given. Occurred in the P2 treatment is the highest PBB average of all treatments, because with the addition of both phytobiotics, it is able to absorb nutrients well and quickly so that the weight gain is better.

3.5 Feed conversion ratio

FCR (Feed Conversion Ratio) is a feed conversion ratio that indicates feed efficiency from chickens. FCR is an important indicator in chicken farming, both broilers and layers. FCR is calculated by comparing the amount of feed required to produce 1 kilogram of broiler meat or 1 kilogram of layer eggs. The smallest FCR value, the more efficient the use of feed and better the productivity of chicken farming.

Table 6. Feed conversion ratio of AKA Chicken

Weeks	P0	P1	P2
6	2.67 ± 0.16	2.81 ± 0.07	2.70 ± 0.10
7	2.82 ± 0.07 ^b	3.05 ± 0.07 ^a	2.98 ± 0.030 ^{ab}
8	3.02 ± 0.16	3.10 ± 0.07	2.91 ± 0.02

9	3.48 ± 0.13	3.59 ± 0.10	3.58 ± 0.01
10	3.78 ± 0.12	3.65 ± 0.08	3.42 ± 0.77

The feed ratio or feed conversion value is generally used as a reference to assess feed intake efficiency consumed by chickens both to weight and to weight growth. The average feed conversion ratio or FCR value of AKA chickens with the treatment of P1 and P2 according to ANOVA indicate a significantly effect ($P < 0.05$) in week 7 on the FCR value of AKA chicken body weight. The average range of feed conversion value or FCR value in AKA chickens is 2.67 - 3.78, which means it's already good enough. However, statistically, phytobiotic feeding was significantly different, but it was not able to upgrade the efficiency of the feed to body weight gain ratio. This can occur because the small weight gain can result from the sudden transfer of feed, and inappropriate cage density. In accord with Gustira et al. [14] if the density of the cage is too low, there will be a waste of space where the chickens will waste a lot of space. waste of space where chickens will move a lot so that energy will be wasted. much wasted.

3.6 Mortality

Mortality can be classified as a critical factor in the success of livestock farming. As with other aspects, environmental extremes, disease outbreaks, inequalities in feed and disease, inequality in obtaining feed including feed nutrition will impact on mortality or death. High mortality rates in chickens often occur in the early or starter period and are lower in the late or finisher period.

Table 7. Mortality rate of AKA Chicken (%)

Weeks	P0	P1	P2
6	0.88 ± 0	0.43 ± 0.31	0.66 ± 0.32
7	0.44 ± 0	0.55 ± 0.16	0.55 ± 0.15
8	0.44 ± 0.32	0.00 ± 0	0.22 ± 0.31
9	0.22 ± 0	0.10 ± 0.14	0.22 ± 0.31
10	0 ± 0	0 ± 0	0 ± 0.00
Average	0.22 ± 0.25	0.13 ± 0.27	0.25 ± 0.22

The average value of mortality according to the results of ANOVA didn't have significant effect ($p > 0.05$). Although it can be observed that there is a decrease in mortality rates in all treatments. No significant difference is known because the temperature and condition of the chickens are the same, meaning that the chickens are not classified based on body weight, which causes small chickens to be unable to compete with other chickens to get food. Temperature and RH during maintenance tend to be the same from each treatment due to the same cage position, based on maintenance the temperature obtained is approximately 25 - 29.9 degrees Celsius and an average RH of 70%. High temperatures can cause heat stress so that chickens are unable to metabolize the body properly. Chickens that are kept if they exceed THI (Temperature Humidity Index) can cause chickens to experience performance problems [15].

4. Conclusion

Treatments P2 (combined turmeric powder and probiotics) showed better result than the other treatments, it significantly affect the body weight produced because the application of phytobiotics can accelerate digestion so the absorption of nutrients is better and the chickens are much larger. Although it hasn't been able to reduce the mortality rate as a whole, but use of phytobiotics can be implemented because it doesn't have negative effects. And using feed substituted with maggot flour is quite competitive to use for native chickens.

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