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Herbal Multivitamins and Probiotic Synergy as a Sustainable Alternative to Antibiotics: Enhancing KUB Chicken Performance During the Grower Period

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ABSTRACT

Antibiotics continue to pose a significant challenge within animal husbandry, as they can lead to residual antibiotics in poultry. Meanwhile, probiotics and herbs have been explored as potential alternative antibiotics to replace their role and promote more sustainable chicken production. The study aims to substitute antibiotics in poultry farming to produce high-performance KUB chickens during the grower period. The research design employed a complete randomized design to assess the variation in production performance of 2,196 KUB chickens (male and female, aged between six to ten weeks), with the treatment groups receiving herbal multivitamins (multivitamins, curcuma extract, amino acids, and electrolytes) and probiotics (containing *Lactobacillus sp., Saccharomyces*, and *Rhodopseudomonas palustris*). The treatments in this study incorporated herbal multivitamins and probiotics, specifically: P0, control (antibiotics); P1, herbal multivitamins; and P2, herbal multivitamins and probiotics. The study was conducted over five weeks, during which the observed variables included feed consumption, body weight, body weight gain, feed conversion ratio, and depletion rate. The findings revealed that the provision of herbal multivitamins and probiotics substantially influenced the performance of KUB chickens during the grower period. The findings indicated that combining herbal multivitamins and probiotics yielded superior performance outcomes (body weight = 805,65 ± 0,92a; FCR = 3,46 ± 0,00 B) compared to other treatments, which could be a substitute for antibiotics in raising KUB chickens.

Keywords: Antibiotics, herbal multivitamins, KUB chicken, performance, probiotic

ABSTRAK

Antibiotik masih menjadi salah satu tantangan di dunia peternakan karena penggunaannya dapat menimbulkan residu pada ayam. Sementara, probiotik dan tanaman herbal berpotensi menggantikan peran antibiotik dan mempromosikan produksi unggas yang berkelanjutan. Penelitian ini bertujuan untuk mengganti penggunaan antibiotik pada peternakan unggas untuk menghasilkan performa ayam KUB periode grower yang baik. Desain penelitian menggunakan Rancangan Acak Lengkap untuk melihat perbedaan performa produksi dari 2.196 ekor ayam KUB (jantan dan betina, umur enam hingga sepuluh minggu) dengan pemberian herbal (multivitamin dan ekstra kurkuma) dan probiotik (mengandung *Lactobacillus sp., Saccharomyces*, and *Rhodopseudomonas palustris*). Perlakuan dalam penelitian ini menggunakan herbal dan probiotik, yaitu P0: kontrol (antibiotik), P1: herbal multivitamin, dan P2: herbal multivitamin dan probiotik. Penelitian dilakukan selama lima minggu dengan peubah yang diamati yaitu konsumsi pakan, bobot badan, pertambahan bobot badan, konversi pakan, dan angka deplesi. Pemberian herbal multivitamin dan probiotik berpengaruh nyata terhadap performa ayam KUB periode grower. Hasil penelitian menunjukkan pemberian kombinasi herbal multivitamin dan probiotik memberikan hasil performa yang lebih baik (bobot badan = 805,65 ± 0,92a; FCR = 3,46 ± 0,00 B) dibandingkan perlakuan lainnya yang dapat dijadikan alternatif pengganti penggunaan antibiotik pada pemeliharaan ayam KUB.

Kata kunci: Antibiotik, ayam KUB, multivitamin herbal, performa, probiotik

INTRODUCTION

A study by Aedah *et al.* (2016) revealed a high consumer preference for native chicken in Indonesia, attributed to its distinctive flavor. One of the native chicken breeds developed in Indonesia is the Balitbangtan Superior Native Chicken (KUB). A notable advantage of KUB chickens is their significantly faster growth rate compared to other local breeds (Mayora *et al*. 2018). In the context of native chicken farming, the quality of feed and the health of the animals are crucial factors, given their significant impact on poultry productivity. The protein component of feed is of particular importance and expense, given its vital role in forming body tissues (Beski *et al.* 2015).

The Indonesian government acknowledges this dependency and has implemented policies to support the domestic production of protein source feed ingredients. This reliance on imported materials contributes to the escalating costs of feed. To mitigate this challenge, there is a growing impetus to explore the utilization of alternative protein sources that do not compete with food needs. One such alternative is maggot, which has been utilized as a protein source in chicken feed (Sinaga *et al*. 2024). Maggots can be processed into a feed ingredient, such as flour (mag meal), reducing feed production costs and serving as a source of animal protein(Ayuningtyas *et al*. 2023). The incorporation of maggot meal into poultry feed has the potential to address environmental concerns in Indonesia (Ayuningtias *et al.* 2024). Maggot feeding as a substitute for conventional protein source feed ingredients has gained significant traction and demonstrated notable outcomes (Dwisyahfani *et al*. 2025).

In addition, administering Antibiotics for Growth Promoters (AGP) in poultry farming is imperative to enhance productivity and optimize feed efficiency. However, as Valentino *et al.* (2020) have indicated, administering antibiotics to chickens can lead to the emergence of resistant bacteria to these medications. According to the Ministry of Agriculture Regulation No. 14 of 2017, the provision of AGP in feed is prohibited. Therefore, an alternative to AGP is necessary. Providing herbs to chickens has been proposed as a potential alternative to antibiotics. The study utilized a range of antibiotic substitutes, including herbs, multivitamins, and curcuma extract, in addition to probiotics. The herbs used in this study are commercial products containing curcuma extract and multivitamins. According to Nurhayati *et al.* (2015), incorporating curcuma extract has been shown to enhance digestive health, promote optimal body weight gain, and improve the functionality of digestive organs. The probiotics utilized in this study are commercial products comprising Lactobacillus sp. and lactic acid bacteria. According to Mutmainna *et al.* (2023), probiotics have been shown to enhance feed conversion ratios, bolster resistance to pathogenic bacterial infections, and maintain the balance of microorganisms in the digestive tract.

This study aims to observe the effects of multivitamins herbal and probiotics on the performance of KUB chickens during the grower period. This study is significant because it aims to reduce antibiotics in chickens and compare the performance of chickens treated with antibiotics with those treated with multivitamins herbal and probiotics.

MATERIAL AND METHODS

Time and Location

This study was conducted over three months, commencing on August 21, 2023, and concluding on October 31, 2023. The study utilized an open chicken cage with a capacity of 3,500 birds, situated in Cikubang village, Bojong Galing village, Bojong Genteng sub-district, Sukabumi district.

Material

This study used 2,196 Ayam Kampung Unggul Balitbangtan (KUB) aged 6 to 10 weeks. The feed used in this study was Maggnesia feed from IPB Vocational College, which is feed for local chicken with a substitution of BSF maggot meal as a source of animal protein of as much as 7.5%. This study utilized herbal products (curcuma extract 65,000 mg/Kg and multivitamins) and probiotic products (containing Lactobacillus sp., Saccharomyces, and Rhodopseudomonas palustris) as alternatives to antibiotics. The study utilized commercial antibiotics containing the anti-coccidia toltrazuril. The nutrient content of the research feed can be seen in Table 1.

Table 1. Nutritional contents of experimental rations

Nutrient	Unit	Content
Water	%	9.535 ± 0.19
Ash	%	8.4 ± 0.21
Crude Protein	%	22.91 ± 0.51
Fat	%	7.64 ± 0.17
Energy	KCal/Kg	3664.6 ± 9.3
Carbohydrate	%	51.515 ± 0.51

Source: Lab analysis (2023)

Experimental Design

This study employs a complete randomized design to investigate the disparities in production performance of KUB chickens subjected to various treatments. The experimental population comprised 2,196 KUB chickens, aged between 6 and 10 weeks, which were randomly assigned to one of three distinct treatments, with each treatment further subdivided into two replicates. The specific treatments administered in this study are outlined below:

P0: Control using antibiotics;

P1: Provision of multivitamins herbal three times a week, on Mondays, Wednesdays, and Fridays;

P2: Combination of multivitamins herbal and probiotics. Probiotics were provided four times a week on Tuesdays, Thursdays, Saturdays, and Sundays. The multivitamins herbal were given according to the same schedule as in P1.

Stages of Research

Chicken grouping. The chicken population is divided into each replicate treatment in the raising stage. The population in the maintenance phase consisted of 2,196 birds. The

population was randomly divided into three treatments and two replicates.

Feeding and drinking. The feeding of KUB chickens in this study involved grower period chicken feed formulated with 7.5% maggot flour content. The feed is administered to the chickens twice daily, in the morning and evening, with the quantity adjusted to meet the chickens' nutritional requirements. Water was provided ad libitum with the various herbal treatments.

Drinking program. Providing herbal treatments and probiotics via drinking water follows a predetermined schedule. The herbal feeding and combination with probiotics are administered from 6:00 a.m. to 1:00 p.m., after which the cages are replenished with clean water until 6:00 a.m. the following day. The doses are 0.5 g/L of water for curcuma extract and 1 ml/L for probiotic. Commercial anti-coccidia were given to the control group of chickens at 0.75 per liter of water given to chickens aged 43-44 days.

Performance recording. Performance recordings were carried out daily, based on the records provided for each cage partition. A performance recording was conducted after the chickens had been weighed. Performance recording was performed according to the established variables.

Observed variables. The variables that were observed included the performance of grower-period KUB chickens. The performance variables encompassed feed consumption, average body weight, body weight gain, Feed Conversion Ratio (FCR), and depletion rate.

Data Analysis

The collected data were then analyzed using descriptive and statistical methods, including ANOVA and the Tukey test ($P < 0.05$). We used Minitab as a statistical software.

RESULTS AND DISCUSSION

Feed Consumption

Purnamasari and Kurniawan (2016) stated that the composition of poultry feed typically includes granular feed, complete feed, feed of animal origin, and concentrate feed. The role of feed is so significant for poultry that close attention must be paid to its quality and nutritional content. The consumption performance of feed in KUB chickens is illustrated in Table 2.

Table 2. Feed consumption of KUB chicken

Age (weeks)	Feed Consumption (g/b/w)	Standard* (g/b/w)
6	260,2	296
7	341,44	338
8	424,59	412
9	479,98	472
10	521,18	519
Total	2027,39	2037

Source: *Ekalinda (2019)

Note: (g/b/w): gram/bird/week

The feed consumption of KUB chickens remained consistent across all treatments during the study. The quantity of feed provided to each treatment was meticulously measured and recorded at the onset of the week before its administration. The feed administered was in the form of mash. As illustrated in Table 2, feed consumption among the KUB chickens during the study period was lower than the standard. Feed consumption among chickens aged 7 to 10 exceeded the standard, likely due to providing higher-than-standard amounts to chickens with body weights below the standard during the grower period. The total feed consumption recorded during the study period was 2027.39 grams per bird per week. This feed consumption figure is notably higher than the results reported in research conducted by Amizar *et al.* (2023), which documented feed consumption of 1967.9 grams per bird per week for KUB chickens reared from 6 to 10 weeks of age.

Body Weight

The analysis of variance showed that the body weight of 10-week-old KUB chickens differed significantly, the highest average body weight being in the P2 treatment group. Qurniawan (2016) posited that factors that affect body weight include sex differences, feed consumption, environment, breed, and feed quality. The mean body weight of KUB chickens is presented in Table 3.

Table 3. KUB Chicken Body Weight

Age (weeks)	P0 (g/b)	P1 (g/b)	P2 (g/b)
6	379.94 ± 5.39	373.44 ± 0.98	369.82 ± 19.00
7	449.60 ± 8.06	424.00 ± 28.07	432.60 ± 13.08
8	616.10 ± 8.58	589.90 ± 12.87	602.70 ± 20.8
9	642.85 ± 3.75	629.70 ± 11.31	644.70 ± 1.98
10	771.90 ± 11.46b	771.90 ± 4.38b	805.65 ± 0.92a

Note: (g/b): gram/bird; Means in the same column/row with different superscript differ significantly ($P < 0.05$)

The mean body weight of KUB chickens at each weighing interval is observed to vary. Chickens with smaller body sizes do not experience a significant increase in body weight, which substantially impacts their weekly body weight. The P2 treatment exhibited a significantly higher body weight of 805.65 grams, surpassing the P0 (771.90 grams) and P1 (771.90 grams) treatments. The P1 treatment produced the lowest body weight each week; however, by the age of 10 weeks, the body weights of the P1 and P0 treatments had equalized. The combination of multivitamins herbal and probiotics (P2) exhibited superior outcomes. The body weight observed in this study exceeded the findings reported by Urfa *et al.* (2017), who documented a body weight of 584.32 grams for 10-week-old KUB chickens. Boki (2020) posited that incorporating probiotics can enhance body weight in chickens by promoting the proliferation of beneficial bacteria within the digestive tract.

Body weights that were not significantly different in weeks 6-9 in the three treatments indicated that the combined administration of herbs and probiotics needed time for an effective mode of action in the digestive tract,

so that accelerated growth began to be seen in week 9 and was significantly different in week 10. Probiotics require a period of adaptation in the gut ecosystem before exerting significant effects on nutrient absorption and growth performance (Patterson & Burkholder 2003), in line with this, Windisch *et al.* (2008) reported that phytobiotics do not act as rapidly as antibiotics; instead, they modulate gut microbiota gradually, which can take several weeks before performance benefits are observed.

Body Weight Gain

The amount of feed consumed significantly influences body weight gain in chickens. One of the criteria for measuring growth is measuring body weight gain. Body weight gain is the increase in body weight an animal achieves during a specified period. The data about body weight gain in KUB chickens are presented in Table 4.

Table 4. KUB Chicken Body Weight Gain

Age (weeks)	P0 (g/b)	P1 (g/b)	P2 (g/b)
6	115.70 ± 10.87	128.92 ± 18.76	119.82 ± 18.29
7	69.66 ± 13.45	50.51 ± 29.00	62.84 ± 32.10
8	166.47 ± 0.52	165.95 ± 40.9	169.56 ± 6.97
9	26.79 ± 4.83	39.80 ± 24.18	42.00 ± 22.73
10	129.05 ± 15.20	142.20 ± 15.70	160.95 ± 2.90

Note: (g/b): gram/bird; Means in the same column/row with different superscript differ significantly ($P < 0.05$)

The result reveals that the lowest weight gain during the grower period occurred at 9 weeks. However, at 10 weeks of age, there was a substantial increase in body weight, with the P2 treatment resulting in the highest gain of 160.95 grams, surpassing the P1 (142.20 grams) and P0 (129.05 grams) treatments. This study's findings are higher than those reported by Hasyim *et al.* (2020), who observed an average body weight gain of 116.7 grams at 10 weeks of age. Mariyam *et al.* (2020) posited that factors such as raising management, feed form, and body weight can influence body weight gain in poultry.

Feed Conversion Ratio of Body Weight

Elevated feed conversion ratios indicate increased feed wastage (Sembada *et al.* 2022). The feed conversion ratio is a metric of feed utilization efficiency, with lower values indicating greater efficiency. The findings concerning feed conversion value are presented in Table 5.

Table 5. Feed conversion rate of KUB chicken body weight

Age (weeks)	P0	P1	P2
6	2.69 ± 0.04	2.73 ± 0.01	2.76 ± 0.14
7	3.03 ± 0.06	3.22 ± 0.21	3.15 ± 0.10
8	2.90 ± 0.04	3.03 ± 0.07	2.97 ± 0.11
9	3.53 ± 0.02	3.60 ± 0.07	3.52 ± 0.01
10	3.61 ± 0.06 A	3.62 ± 0.02 A	3.46 ± 0.00 B

Note: Means in the same column/row with different superscript differ significantly ($P < 0.05$)

The data in Table 5 illustrate the impact of the P2 treatment administered at 10 weeks of age. The lowest feed conversion ratio (FCR) was observed in the P2 treatment, with a value of 3.46 at 10 weeks of age. The feed conversion value in this study is lower than the results reported by Takdir *et al.* (2019) at 10 weeks, which resulted in an average FCR of 4.4. These findings suggest combining multivitamins herbal and probiotics (P2) substantially influences feed conversion. Marsaban *et al*. (2020) reported that probiotics are a mixture of non-pathogenic microbes that are beneficial and can be used to facilitate digestion and increase appetite. Pane (2018) further elaborated that the provision of probiotics can maintain the balance of microorganism composition in the digestive system of poultry, resulting in increased digestive power of feed ingredients. The efficacy of herbs is maximized when they are used in conjunction with probiotics. Pertiwi *et al*. (2017) reported that herbs, including curcuma extract and multivitamins, derived from the turmeric plant possess antibacterial properties, which can reduce pathogenic bacteria and enhance digestive tract health in chickens.

Depletion Rate

Depletion rate is a critical indicator of performance enhancement. The depletion value is the depreciation value of the number of chickens due to mortality and culling during the rearing period. Risnajati (2012) asserts that effective management practices are pivotal in minimizing mortality rates. In addition to ensuring the provision of vaccines and medicines according to dosage guidelines, implementing optimal management strategies is also essential. The mortality rate is a critical component in evaluating the efficacy of poultry management practices. The depletion rate is illustrated in Table 6.

Table 6. Depletion Rate of KUB Chicken

Age (weeks)	P0 (%)	P1 (%)	P2 (%)
6	1.10 ± 0.01b	0.96 ± 0.19b	2.73 ± 0.40a
7	1.10 ± 0.01	1.50 ± 0.58	1.5 ± 0.18
8	1.24 ± 0.19	2.05 ± 0.20	1.10 ± 0.40
9	1.00 ± 1.32	1.37± 0.39	1.50 ± 0.58
10	0.82 ± 1.16	0.96 ± 0.97	0.96 ± 0.59

Note: Means in the same column/row with different superscript differ significantly ($P < 0.05$)

As shown in Table 6, the depletion rate of P2 (2.73 percent) at 6 weeks of age is significantly higher than that of other treatments. However, in the weeks after, the depletion rate decreased. The depletion rate derived from the present study is higher than the rates reported in the research by Hadi *et al.* (2021), which resulted in a total depletion rate of 2.08% over the 10-week raising period. The findings of this study suggest that factors beyond animal health, including environment, quality of DOC, and others, influence the depletion rate. Amam (2022) posited that factors such as inadequate environmental management, weather changes, particularly in open house cages, DOC quality, genetics, and the emergence of outbreaks can contribute to depletion.

The present study found that depletion was influenced by poor DOC quality and weather factors that often fluctuate significantly, affecting the chickens raised in an open-house system. The farm's management approach, which does not group chickens based on body size, has been identified as a contributing factor to the prevalence of cannibalism.

CONCLUSION

Providing multivitamins herbal and probiotic supplements to KUB chickens as a substitute for antibiotics has yielded superior performance outcomes compared to antibiotics. The herbal treatment (P1) exhibited a performance outcome that was not significantly different from the antibiotic control treatment (P0), yet it demonstrated superior results regarding body weight gain performance. The combination of multivitamins herbal and probiotics (P2) exhibited a similar trend, demonstrating enhanced performance in terms of body weight and feed conversion efficiency. However, the depletion rate was higher than that of other treatments, and its trend was decreasing in the coming weeks.

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