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Optimizing Broiler Production in Urban Area Using Liquid Premix

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ABSTRACT. *High temperature in narrow areas can cause heat stress in broiler. In this condition, broiler performance will decrease, so efforts are needed to deal with these negative impacts. One of them is by providing premix as a supplement. This study aims to find the best dose of commercial premix containing vitamins C, E, and* micronutrients *to improve the performance of broilers reared in areas with ambient temperatures above thermoneutral. The study used a total of 160 Cobb strains day old chick (DOC) with 4 treatments and 5 replications. Each replication consisted of 8 chicks. The treatment was a premix dose consisting of P0 (0 mL); P1 (0.1 mL); P2 (0.15 mL); and P3 (0.20 mL). The ambient temperature was 29-30 °C and 70% humidity. The observed data were the body weight, the average body weight gain, feed consumption, water consumption intake, and feed conversion ratio (FCR). The data were analyzed by completely randomized design. Results of this study showed that the use of premix as a feed supplement did not significantly different (P>0.05) on the broiler performance. The average body weight gain at 28 days was 1689 grams, 132 grams of feed intake, 320 mL of drinking intake, and FCR 1.55. The use of premix with dose up to 0.20 mL as a feed supplement for broiler in narrow areas has not shown a significant improvement in performance.*

Keywords : Broiler, performance, liquid premix, maintenance of narrow area

INTRODUCTION

Broiler is one of the livestock supplying the needs of animal protein for humans. Broiler growth is very fast with a high level of efficiency. To get optimal performance, broilers need comfortable environmental conditions. One of the factors that affect the comfort of the environment is temperature. Broilers require an ambient temperature of around 24°C (Hirakawa et al., 2020; Shakeri et al., 2020; Zangeneh et al., 2018), and this is a problem for livestock in tropical regions such as Indonesia, because it has an ambient temperature of around 29-36°C (Kasim et al., 2019). Furthermore, this is a particular problem for farmers in urban areas, because the ambient temperature in urban areas is higher than in rural areas.

High ambient temperatures will cause broiler heat stress, and will increase the production of free radicals in the body, resulting in decreased performance (Hu et al., 2020; Lara & Rostagno, 2013; Miao et al., 2020). One way that can be done to overcome this problem is by giving a premix that contains vitamins C, E and micro-nutrients. Vitamin C has been reported to function as an antioxidant to deal with the negative effects of free radicals in the body (Attia et al., 2017; Ghazi et al., 2015; Shakeri et al., 2020). Vitamin E has also been reported to function as an antioxidant and can improve broilers' performance in areas with temperature conditions above thermoneutral (Pompeu et al., 2018; Shakeri et al., 2020).

Liquid premix consumed by broilers contains vitamins and essential and non-essential amino acids. Amino acids have an important role in boosting the immune system, influencing nerve activity in the brain, accelerating repair of damaged tissue, protecting the digestive tract from various toxic substances, encouraging growth hormone secretion and

reducing ammonia levels in the blood (Nurhikmah et al., 2022), while vitamins play a role in maintaining and sustaining a healthy body against disease and the effects of stress, stimulate body growth (better growth of meat) and increase appetite as well as to increase meat production (Nurdiyah & Siti Nuraliah, 2022).

The use of premix to improve broiler performance has been reported by Ao et al. (2019), Ogunwole and Mosuro (2020) who state that the use of premixes containing vitamins and minerals can improve body weight and feed consumption for broilers. This study aims to find the best dose of using a commercial premix containing vitamins C, E and micro-nutrients to improve the performance of broilers reared in areas with ambient temperatures above thermoneutral.

MATERIALS AND METHODS

Livestock, Cages, and Instruments

The livestock used were Day Old Chick (DOC) Cobb 500 strain of 160 chicks with an average body weight of 40 grams. Chickens were kept for 28 days in Singosari, Kab. Malang, East Java. The cage used was an open house which divided into 20 flocks measuring 100 cm x 100 cm with a capacity of 8 chicks. The feed given is commercial feed from PT. Japfa Comfeed Indonesia and given adlibitum.

Giving liquid premix is done by mixing it in drinking water when the chickens were 14 days old until the age of harvest. The content of liquid premix is multivitamins (vitamin A, vitamin B complex, vitamin C, and vitamin K3) as well as essential and non-essential amino acids. The liquid premix used is a commercial premix sold in the market.

Research Design

This study used a completely randomized design (CRD) analysis using 4 treatments and 5 replications. Differences between treatments were further tested using the Least Significant Difference test. The treatment for giving liquid premix in drinking water is as follows: P0 = No treatment (does not contain liquid premix), P1 = Drinking water containing 0.1 ml/1000ml liquid premix, P2 = Drinking water containing 0.15 ml/1000ml liquid premix and P3 = Drinking water containing 0.2 ml/1000 ml of liquid.

Research Parameters

The variables in this study were broiler productivity which included feed consumption, feed conversion ratio (FCR), drinking water consumption, average body weight gain (ABWG), and harvest weight. Harvest weight was carried out by weighing the broilers at the age of 21 days and 28 days. Calculations to obtain broiler productivity data are as follows:

Equation 1 The feed consumption:

Feed Consumtion (g/chick) = Feeding (g) – Feed Leftover (g)

Equation 2 The FCR:

$$FCR = \frac{\text{Feed Consumption}}{\text{Weight Gain}}$$

Equation 3 The water consumption

Water Consumption = Given drinking water (liter) – Remaining drinking water (liter)

Equation 4 The weight gain

Weight Gain = weight at harvest (g) – initial weight (g)

RESULTS AND DISCUSSION

The role of liquid premix as a feed supplement on the performance of broilers reared in urban areas is shown in Table 1. Broilers were kept in open house cages in residential areas located 487 meters above sea level with an average temperature of 24°C – 33°C, humidity 65 -75%, and the average rainfall of 349 mm per year.

Table 1. Broiler performance reared in urban areas by providing liquid premix as a feed supplement.

Parameter	Age (days)	Treatments				P-Value	Standard
		P0	P1	P2	P3		error
Weight (g)	15	474	478	471	470	0,tan787	3,048
	21	1018	1022	1037	1008	0,715	0,715
	28	1657	1735	1676	1676	0,902	17,368
Weight Gain (g)	15-21	543	544	568	538	0,666	18,023
	22-28	639	670	639	676	0,684	27,824
	15-28	1182	1214	1206	1214	0,878	32,139
Feed Consumption (g)	15-21	124	124	126	125	0,887	1,165
	22-28	136	146	140	133	0,244	2,277
	15-28	130	135	133	129	0,506	1,502
Drinking Water Consumption (mL)	15-21	254	242	252	255	0,212	2,250
	22-28	399	376	383	395	0,561	5,695
	15-28	327	309	317	325	0,301	3,574
Feed conversion ratio	15-21	1,58	1,60	1,56	1,65	0,742	0,300
	22-28	1,51	1,55	1,53	1,38	0,344	0,270
	15-28	1,55	1,57	1,54	1,52	0,965	0,190

Description: P0: 0 mL premix; P1: 0,1 mL premix; P2: 0,15 mL premix; P3: 0,20 mL premix.

Liquid premix given up to 0.20 mL/L through drinking water as a feed supplement to broilers reared in urban areas had no significant effect (P>0.05) on the broiler's performance (body weight, weight gain, feed consumption, drinking water consumption and feed conversion ratio). The average body weight at 15 days of age at P0, P1, P2 and P3 were 474, 478, 471 and 470 grams, respectively. At 21 days old it was 1018, 1022, 1037 and 1008 grams and at 28 days old it was 1657, 1735, 1676 and 1676 grams.

The average final body weight in this study generally reached the Cobb standard, in which at the age of 28 days, the broiler chickens had a weight of 1.615 grams (Cobb-Vantress, 2018). In this study, the average weight at the age of 28 days broiler was 1.689 grams (Table 1). Giving premix in this study did not significantly affect the final weight. This is because the weight gain in this study also had no significant effect. Final weight is the accumulation of initial weight and weight gain during the rearing period (Liu et al., 2020; Mirshekar et al., 2013). Weight gain is a result of the growth of body tissue cells. Body tissue cells can be formed if basic nutritional needs are met and these nutrients can be obtained from feed. So, the higher the feed consumption, the higher the body weight growth (He et al., 2015; Sahin et al., 2017). In this study, feed consumption between treatments was not significantly different (Table 1), so weight gain in this study was also not significantly different.

Broiler body condition is one of the factors that affect feed consumption. Giving liquid premix can increase feed consumption, this is because liquid premix given through drinking water can complement micronutrient deficiencies, so broilers will be healthy because their nutritional needs are met properly. This is as reported by Gatne et al. (2010) that giving premix to broilers can increase antibody titers. The same thing was also reported by Ao et al. (2019) & Ogunwole and Mosuro (2020) that giving premix to broilers can increase feed consumption. In addition to having complete amino acids, the premix used in this study also contains vitamin C, apart from vitamins A, D, B complex and K. Vitamin C has been known to improve broiler performance because it can anticipate stress (Ghazi et al., 2015; Yu et al., 2021).

However, the results of this study are contrary to those described above, that giving

premix can increase feed consumption. The results of this study did not show a significant effect on the level of broiler feed consumption. This is suspected because the dose given was too small, so it did not shown significant results. The highest dose given in this study was 0.20 mL/liter of drinking water (0.02%). Ogbu et al., (2020) reported that the use of premix up to 0.375% through feed has not shown a significant increase in feed consumption.

Feed conversion ratio (FCR) is the ratio between total feed consumption and body weight gain. The lower the FCR value, the higher the level of feed use efficiency. FCR is affected by the ability of livestock to digest feed and synthesize body cells. In this experiment, giving premix up to 0.02% through drinking water as a feed supplement did not show a significant difference (P>0.05). The FCR value in this study was generally greater than the Cobb standard, where at the age of 28 days broiler chickens have an FCR of 1.37 (Cobb-Vantress, 2018), while in this study the FCR at 28 days reached 1.5 grams (Table 1).

The formation of body cells is influenced by the balance of amino acids in the feed. Adding a premix containing amino acids will increase the process of formation of body cells, so that the resulting FCR is low. This is in accordance with the results of research by Ogunwole & Mosuro (2020) which explains that adding premix through feed can reduce FCR. In addition, the premix also contains microminerals (trace minerals). The addition of trace minerals to broiler feed can increase the efficiency of feed utilization (Sadeq et al., 2018). That is why, although statistically it has no significant effect, on average it shows a trend that the higher the premix dose given, the lower the resulting FCR.

CONCLUSION

The use of liquid premix at a dose of up to 0.02% as a feed supplement given in drink water of broilers kept in urban areas has not shown any improvement in performance.

CONFLICT OF INTEREST

The authors declare that they do not have a conflict of interest related to the material discussed in this publication .

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