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Effects of Altitude Differences on the Performance of Broiler Chicken Kept in Closed House Cage

Z. R. Nugraini, L. D. Mahfudz, and S. Kismiati

Faculty of Animal Husbandry and Agriculture, Diponegoro University
Corresponding Author: zulfirestunugraini31@gmail.com

ABSTRACT

This study aimed to examine the effect of differences in altitude on the performance of broiler chickens. The experimental design used was a completely randomized design (CRD) with 3 treatments and 8 replications. For this research, the broiler chickens were reared in closed house cages at different altitudes: lowlands, medium lands, and highlands with the same Standard Operation Procedure (SOP). The treatments applied were T1 (broilers reared at an altitude of ± < 600 meters), T2 (broilers reared at an altitude of ± 800 – 1000 meters) and T3 (broilers reared at an altitude of ± > 1000 meters). The data were analyzed to determine the treatment effect using Duncan's Multiple Distance Test. The parameters measured were feed consumption, body weight gain (WG), feed conversion ratio (FCR), index performance (IP) and income over feed cost (IOFC). The results showed that altitude had a significant effect (P<0.05) on body weight gain (WG) in the finisher phase, feed conversion ratio (FCR) in the starter phase and finisher phase, index performance (IP) in the starter phase and finisher phase as well as income over feed cost (IOFC). From this study, it can be concluded that the performance of broiler chickens in the medium-altitude is better than the lowlands and highlands, and economically it is more profitable than rearing them in the highlands.

Key words: closed house, altitude, finisher, performance, starter.

INTRODUCTION

Indonesia is a tropical country consisting of low, medium and high plains. The lowlands have an altitude of <600 meters, the medium lands are at 800-1000 meters and the highlands are >1000 meters (BMKG, 2013). The difference in terrain affects the macroclimate and microclimate of the closed house cage. Extreme environmental temperatures can cause chickens to experience stress/stress, resulting in reduced performance. High and low ambient temperatures combined with non-standard wind speeds in the cage have a negative effect on weight gain, feed conversion, health and mortality rates of broilers (Dharmawan et al., 2016). Temperatures that are too high/heat stress can reduce broiler growth (Lara and Rostagno, 2013).

Qurniawan et al. (2016) stated that altitude > 700 meters significantly affected physiological status, feed consumption, drinking water consumption, final body weight, and FCR. According to Marom et al. (2017), the altitude has a very significant effect (P < 0.01) on feed consumption, harvest weight, FCR and depletion, and broiler maintenance in closed house cages in the highlands with an altitude of > 3000 meters has the most optimal performance. Syamsuryadi et al. (2017) stated that broilers reared in highlands performed better.

The purpose of the research was to see how the topography elevation in the closed house affects broiler chicken performance. Besides, it also intended to determine more about the best altitude for keeping broilers at to achieve the best possible broiler performance.

MATERIALS AND METHOD

The study used a completely randomized design (CRD) with 3 treatments and 8 replications. Parameters measured included: feed consumption, body weight gain, feed conversion, performance index and income over feed cost.

This research was conducted on PT's closed house farm broiler chicken. Charoen Pokphand is located in the low, medium, and highlands in Central Java with the same cage size measured 120 m long, 12 m wide and has a capacity of 22,500 birds. The samples taken from the lowlands were broiler chicken farms in Demak, the medium lands in Gunungpati, and the highlands in Ampel, each of which selected 2 closed-house cages. Maintenance used complete feeds S10, S11, and S12. The tools used were analytical scales to measure the weight of chickens, an ammonia detector to measure ammonia, a pH meter to measure pH, a kestrel to measure temperature, humidity and wind speed and a black globe temperature to measure solar radiation.

The data obtained were analyzed using analysis of variance (ANOVA) with the F test. If the treatment significantly affected the parameters, it was continued with Duncan's Multiple Distance Test (Astuti et al., 2015).

RESULT AND DISCUSSION

Bodyweight Gain

Table 1 shows the effect of treatment T1 (lowlands), T2 (medium plains) and T3 (highlands) on body weight gain of broiler chickens kept in closed house cages.

Table 1. Effect of treatment on body weight gain of broiler chickens raised in closed house cages

Treatment	WG (g)	
	Starter	Finisher
T1 (Demak)	447.25	1,065.79[a]
T2 (Gunungpati)	436.08	1,115.08[a]
T3 (Ampel)	445.42	975.04[b]
P-value	0.72	<0.001
SE	10.28	18.07

Description: Different superscripts in the same column indicate differences signifikan (P < 0,05)

Table 1 shows that the elevation of the plains had no significant effect on broiler body weight gain in the starter period but had a significant effect (P < 0.05) in the finisher period.

The altitude factor had no significant effect (P > 0.05) on body weight gain in the starter phase because the maintenance was still in the brooding period. Maintenance used a brooder, and the temperature, humidity, and wind speed were set according to company standards. Wahyudi and Akbar (2018) stated that the success of the brooding period was influenced by temperature, humidity, and air quality in the cage.

The altitude factor had a significant effect (P < 0.05). Bodyweight gain at T3 was lower than T1 and T2, but T1 and T2 were not significantly different. Differences in body weight gain due to differences in macroclimate and microclimate. Qurniawan et al. (2016) stated that the difference in elevation of the plains resulted in differences in the microclimate. Endraswati et al. (2019) research results show that the macroclimate influences the microclimate. The low body weight gain at T3 caused a higher effective temperature than T1 and T2 (25° vs. 23°C and 22°C) with lower wind speed (1.0 m/s vs. 1.8 m/s and 1, 7 m/s). Broilers at high temperatures will reduce body temperature by reducing feed consumption and increasing water consumption to decrease body weight gain. The results in the research of Kusnadi (2008) and Olanrewaju et al. (2010) stated that broilers reared at high temperatures have lower body weight than those at low temperatures. Sugito and Delima (2009) and Qurniawan et al. (2016) found that rearing broilers at high temperatures reduce body weight gain. The increase in body weight at T1 and T2 was not significantly different because, based on the measurements made, the effective temperatures were almost the same, namely T1 at 23°C and T2 at 22°C.

Feed Conversion Rate (FCR)

Table 2 shows the treatment effect on feed conversion of broiler chickens kept in closed house cages. Table 2 shows that the elevation of the terrain has a significant effect (P < 0.05) on feed conversion in the starter and finisher phases.

Table 2. Effect of Treatment on Feed Conversion of Broilers Raised in Closed House Cages

Treatment	FCR	
	Starter	Finisher
T1 (Demak)	1.33[a]	1.41[a]
T2 (Gunungpati)	1.19[b]	1.30[b]
T3 (Ampel)	1.20[b]	1.47[a]
P Value	0.01	0.00
SE	0.03	0.03

Note: Different superscripts in the same column show significant differences (P < 0.05)

Bodyweight gain was not significantly different in the starter period, but feed conversion was very different. The feed conversion in the medium (T2) and high (T3) plains was better/lower than the lowlands (T1). The study results follow Ginger et al. (2016) research that FCR is better/lower in broilers reared at low temperatures. The temperature and humidity of the medium terrain (T2) and highland (T3) were the same (28°C, 78%) and lower than the lowland (T1), so the feed conversion was not significantly different but lower than T1.

Index Performance (IP) and Income Over Feed Cost (IOFC)

Table 3 shows the treatment effect on the performance index and income over feed cost of broiler chickens kept in closed house cages.

Table 3. Analysis results of various performance indices and income over feed cost of broiler chickens

Treatment	Parameter		
	Starter	Finisher	
	IP	IP	IOFC (Rp)
T1 (Demak)	207.41[b]	404.94[b]	26,209.6[a]
T2 (Gunungpati)	239.55[a]	461.09[a]	26,975.1[a]
T3 (Ampel)	218.13[b]	373.40[b]	24,585.8[b]
P Value	0.00	0.00	0.00
SE	6.22	11.66	318.23

Note: Different superscripts in the same column showed significant differences ($P < 0.05$)

The study results in Table 3 show that the achievement index is high. According to Arwita (2013), the standard achievement index of broiler chickens is 200. The higher the value of the achievement index, the better performance of broiler chickens and the more efficient use of feed and costs.

The analysis of variance showed that the elevation of the terrain had a significant effect ($P < 0.05$) on the performance index in the starter and finisher phases. The altitude factor has a significant impact ($P < 0.05$) on the performance index of the starter phase and finisher phase because the feed conversion (FCR) in the starter and finisher phases was also different. Following the opinion of Daud (2005) that the performance index is influenced by feed conversion.

The elevation of the plains had a significant effect ($P < 0.05$) on the IOFC; this was because the FCR was also significantly different. The IOFC of broilers reared in the highlands is lower than in the low and midlands because the FCR in the highlands is higher than in the low and midlands. The income over feed cost in the highlands resulted in a low value because it resulted in low body weight gain of chickens in the highlands. Following Rasyaf (2011) opinion, the factors that affect the IOFC value are bodyweight, seeds, feed rations, and prices.

CONCLUSION

This study concludes that the performance of broiler chickens in the medium lands is better than in the lowlands and highlands and is economically more profitable than rearing in the highlands.

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