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The Effect of Differences in Closed House Density on the Outlet Near Zone on the Finisher Phase Broiler Performance

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Abstract

Research on the Effect of Differences in Density of Closed House Cages in the Zone Near Outlet on Broiler Performance in the Finisher Phase, has been carried out for 40 days, from May 25, 2021 to July 3, 2021. The study was conducted at Farm H. Noto Miharjo Adiwarno Village, Buayan District, Kebumen Regency, Central Java. This study aims to determine the effect of differences in cage density in the zone near the outlet in the closed house cage on the performance of the finisher phase broiler chickens and to find out how much the density of the cage in the zone near the outlet in the closed house cage is capable of producing optimal finisher phase broiler performance. This research was conducted using the Experimental Method. The design used was a completely randomized design (CRD), which consisted of 4 treatments, namely P0 (cage density 10 birds/meter2), P1 (cage density 12 birds/meter2), P2 (cage density 14 birds/meter2), and P3 (cage density 14 birds/meter2). cage 16 tails/meter2). Each treatment was repeated 5 times, and each replication consisted of a different number of boilers according to the density of the cage used. The observed variables were feed intake, daily weight gain and feed conversion. The data obtained were analyzed using variance, if there was an effect of treatment followed by Duncan's multiple area test. The conclusion of this study was the difference in density of closed house cages in the zone near the outlet had a significant effect on daily body weight gain, but had no significant effect on ration consumption and feed conversion. The cage density of 12 birds/meter2 can produce optimal body weight gain.

Keywords: Closed house, outlet, broiler, feed consumption, body weight gain, feed conversion.

Introduction

Nowadays, the development of poultry, especially broiler cultivation, is increasing rapidly, in addition to having a high economic value, also because the demand for broiler products is increasing. The broiler maintenance period is quite short, namely until the age of 35 days or even shorter, this makes the broiler maintenance business increasingly in demand as an alternative business that is quite promising.

The development of broilers is now becoming more efficient both in terms of body weight and feed efficiency, this aside from improving seeds and feed, it is also

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supported by better maintenance processes, including the use of modern cages or commonly known as closed houses. According to Sujana et al., (2011), broiler maintenance using a closed house system is one of the technological innovation efforts to deal with extreme weather changes, so that it is expected to minimize the adverse effects of environmental conditions or climate change outside the cage. The purpose of using a closed house system is to create a controlled microclimate in the cage, increase productivity, land and labor efficiency and create an environmentally friendly livestock business. The use of closed house cages can reduce the effect of temperature outside the cage with the help of a fan so that it can be adjusted so that the environment in the cage can be conditioned according to optimal broiler needs. One of the drawbacks of closed house cages is that it requires a fairly high cost so that in the manufacturing process usually farmers will maximize the population or cage capacity even though the density of broilers in the cage greatly affects the achievement of body weight, especially in the finisher phase. According to Nurfaizin et al. (2014), too high a density has a negative effect, namely an increase in temperature and humidity in the cage and poor air circulation, resulting in broiler stress.

Closed house cages have different zones inside, where zone 1 near the cooling pad has a lower temperature than zone 4 which is close to the exhaust fan, which gets accumulated heat from zone 1 to zone 4. This causes differences in temperature and humidity , and will have an impact on differences in ammonia levels (Renata., 2018). From the difference in ammonia levels, it will have an impact on achieving uneven body weight or it can be said that uniformity is not achieved according to the desired target. Practical efforts that are easy to do to overcome differences in ammonia levels in each zone are to fill the space in each zone of the cage with a different number of broilers or differentiate the density of broilers in each zone. The right density really supports the success of broiler production, improves room performance optimization, and is important to ensure broiler safety. Non-standard cage densities can cause foot pain, bruises, and death, as well as making it difficult to clean up dirt or debris. There are many differences of opinion regarding the density of cages in several countries around the world, but in general in countries that have high temperatures or tropical countries the ideal cage density is around 28-30 kg/m2 (Charles, 2002).

A hot and humid cage will make it difficult for livestock to balance their body heat, so the optimum cage density is 8 heads/meter2 (Nuriyasa, 2003). The normal density is usually 1 meter: 10 birds, this is because with a closed drum system, the room temperature can be set cooler, so that the density is more efficient (Sulistyoningsih, 2003). The results of research conducted by Woro et al., (2019), showed that the density of the cage had a significant effect on ration consumption, body weight gain, and feed conversion. The cage densities of 8 birds/m2 and 12 birds/m2 resulted in higher performance than others. In a previous study conducted by Ismail et al., (2013) that broiler farming using closed house cages is more profitable than open house cages with the same broiler population. Therefore, it will be more efficient if the closedhouse cage can be filled with a higher density while still getting optimal final performance. Setting the right density difference is expected to support the achievement of optimal production while still paying attention to the efficiency of the business capital that has been issued.

Materials and Methods

Materials

The livestock used in this study were Day Old Chicken (DOC) type MB 202 produced by PT Japfa Comfeed Indonesia as many as 6000 heads were kept in the main cage until the age of 21 days. The commercial rations used were broiler rations with SB code 10 types of prestarter rations (1-14 days), SB code 11 types of starter rations (15-21 days) and SB code 12 types of finisher rations.

Table 1. Commercial Ration Nutrient Content SB 10, SB 11 and SB

Nutrient Content	Prestarter (SB 10)	Starter (SB 11)	Finisher (SB 12)
Crude Protein *	22%	21%	19%
Crude Fat *	5%	5%	5%
Crude Fiber *	4%	5%	5%
Energy Metabolism **	2700 Kkal/kg	2800 Kkal/kg	2900 Kkal/kg

Information :
* PT. Japfa Comfeet Indonesia, 2012.
** Standar Nasional Indonesia (SNI) 2006.

The cage used is a closed house cage at Farm Noto Miharjo Mitra PT Japfa Comfeed Indonesia in Kebumen, Central Java. Manufacture of 20 cage plots located near the outlet. Each cage plot measures 1 meter long and 1 meter wide, where the bulkhead between the cage plots uses a wire framed wood. The number of broilers in each cage plot was according to treatment and replication. 1 place for drinking water and 1 place for rations are provided in each cage plot. 260 broilers aged 22 days were taken randomly from the main cage. The average broiler body weight is 1001 grams/head with a coefficient of variation of 2.50%.

Methods

This research was conducted at Farm Noto Miharjo Mitra PT. Japfa Comfeed Indonesia Adiwarno Village, Buayam District, Kebumen Regency, Central Java from May 25, 2021 to July 04, 2021. The ration is given once, in the morning at 8 am. The next day at 7 am the remaining rations were collected and weighed to calculate the ration consumption. Provision of drinking water ad libitum. Ammonia level measurements were carried out in the morning at 6.30 am, in the afternoon at 12.30 pm and at 7.30 pm at night with an ammoniameter. Harvest broilers aged 35 days, then weighed and recorded the final weight.

Research Design and Statistical Analysis Experimental research used a completely randomized design with 4 treatments and 5 replications. Each treatment and replication used a different number of broilers according to the density of the cage used. The data obtained were analyzed by analysis of variance (ANOVA). If the results of the analysis of variance have treatments that have a significant effect at the 5% level, then it is continued with Duncan's multiple distance test (Steel and Torrie, 1993).

The treatments consisted of P0: cage density of 10 birds/m2, P1: cage density of 12 birds/m2, P2: cage density of 14 birds/m2, P3; cage density 16 birds/m2. Parameters observed : feed intake (g/head/day). Feed intake is the result of weighing the initial ration minus the remaining ration divided by the length of maintenance. Daily Weight Gain (g/head/day). Daily weight gain is the result of the final body weight minus initial body weight divided by the length of maintenance. Feed conversion. Feed conversion is calculated based on the total ration consumption divided by body weight gain.

Results and Discussion

Effect of Treatment on Feed Intake

Feed intake is the process of entering rations given to livestock for metabolic purposes in the body as a fulfillment of life needs, nutrients used for basic life, growth, production and reproduction (Rasyaf, 2004). The average of feed intake of the research can be seen in Table 2 which shows the highest average feed consumption in treatment P1 (cage density 12 birds/m^2) which is 119.59 g/head/day and the lowest is P2 (cage density 14 birds/ m^2), namely 109.11 g/head/day. The average feed intake according to Jonas et al., (2018) for 14 days of rearing (aged 22-35 days) was 154 g/head/day. This result is higher than the average feed intake of broiler rations in this study, which is 115.58 g/head/day.

Table 2. Average of Feed Consumption, Weight Daily Gain, and Feed Coversion

Variable	Treatments			
	P0	P1	P2	P3
Feed consumption (gr/head/day)	118.01^a	119.59^a	109.18^a	115.57^a
Daily weight gain (gr/head/day)	65.29^a	67.01^a	53.46^b	56.13^b
Feed conversion	1.81^a	1.79^a	2.08^a	2.01^a

Superscript different on the same line, show significantly different (P<0.05)

The results of the analysis showed that the difference in cage density had no significant effect (P>0.05) on feed consumption, which means that the difference in cage density had a relatively similar effect on feed consumption. This is presumably because the content of metabolic energy in the feed is the same. According to the opinion of Anggorodi (1994) that the energy level in the ration determines the amount of ration consumed and most of the ration consumed is used to meet the basic needs of life, growth and production. Furthermore, Rahayu et al., (2011) stated that broilers consume rations to meet energy needs, if the energy in the ration is high it will result in low ration consumption, on the contrary if the energy content is low then consumption will be high.

Another thing that causes no significant effect of treatment on feed consumption is because the comparison between the number of broilers and the ration place in each cage plot still meets the standards, and broilers will easily get rations so that there is no competition in consuming rations. According to the opinion of Jonas et al., (2018) that a 5 kilogram manual ration can be used for 30-60 broilers. According to Fadillah (2013) that the level of competition between broilers in obtaining rations can be reduced if the ratio of ration places and number of broilers is balanced, with conditions like this each ration will have the same opportunity to get rations. Furthermore, Nova et al., (2007) stated that in principle, if 80% more broilers can eat together, the ration provided is sufficient for the number of broilers in the cage and vice versa.

Leeson and Summers (2001) state that feed consumption is influenced by several factors including ration energy, growth rate, environmental conditions, nutrient substances, ration form and stress. Furthermore, Faiq et al., (2013) stated that the factors that affect the consumption of rations are environmental temperature, broiler health, cages, ration containers, nutrient content in the ration and stress that occurs in the poultry.

Weight Daily Gain

Weight daily gain was obtained from the comparison between the difference between final body weight and initial body weight with the length of maintenance (Fakhrudin, 2016). Daily weight gain in the study can be seen in Table 2 showing the average daily weight gain ranging from 53.46-67.01 g/head/day. Research conducted by Mariyam, (2020) obtained that the average daily weight gain was 50.57 g/head/day until the broilers were 28 days old. The results of this study showed a higher daily weight gain of 60.47 g/head/day.

The results of the analysis showed that the difference in cage density significantly ($P<0.05$) affected the daily weight gain of broilers. The daily weight gain at P0 and P1 was not significantly different, P2 and P3 were not significantly different, but P0 and P1 were significantly different from P2 and P3 meaning that the cage density of 14 fish/m^2 and 16 fish/m^2 could reduce broiler daily weight gain. This is due to an increase in ammonia levels which results in irritation of the respiratory tract, so that the oxygen level that enters the body is not optimal, the impact of the metabolic process is not perfect, namely disturbance of nutrient absorption in the broiler intestinal mucosa which results in decreased daily weight gain. In accordance with the opinion of Wideman et al., (2013) that the achievement of lower body weight gain and higher ration conversion was caused by damage to the lung organs originating from the impact of increased ammonia levels in the cage and oxidative stress. Furthermore, Miles et al. (2004), increased oxidative stress can cause livestock to be susceptible to respiratory diseases and increase mortality.

Increased levels of ammonia can cause heat stress due to failure of thermoregulation. Sugito et al. (2010), stated that heat stress has an impact on stunted broiler growth because more energy is used for homeostasis than for growth. Qurniawan (2016) explained that the temperature in the cage is a combination of environmental heat that comes from solar radiation and metabolic heat in the chicken's body that is released into the environment. High air temperatures will cause broilers to experience heat stress and a decrease in energy will occur. This happens because the energy in the broiler body that should be converted into body weight has been used first to overcome the excess heat in the broiler body.

Ammonia levels at P0 and P1 are 5 ppm, lower than ammonia levels at P2 and P3 are 16.5 ppm. The increase in ammonia levels at P2 and P3 was due to more excreta output as the broiler population increased. According to Pereira (2017) the ammonia produced in the cage comes from fermentation between excreta and cage litter which decomposes into urea. Although the levels of ammonia in P2 and P3 are still below the tolerable threshold of 25 ppm for broilers (Homidan et al., 2003) but it can result in a decrease in broiler productivity. According to Miles et al.(2004), direct exposure to ammonia can reduce body weight up to 8% in cattle aged 1 – 28 days. According to Jonas et al., (2018) at the age of 21 days and over becomes a critical period because at that age feces and ammonia levels begin to accumulate. Ammonia with high levels can trigger cases of respiratory diseases such as coughing / snoring. Ammonia levels at the level of 20 ppm can cause siliostasis (cessation of cilia or feathers vibrating) and deciliosis (damage to cilia), and ultimately damage the broiler respiratory tract mucosa. As a result, germs freely enter the broiler's respiratory system deeper into the air sacs.

The factors that affect body weight according to Qurniawan (2016) are gender differences, ration consumption, environment, seeds, and ration quality. Furthermore, according to Wijayanti (2011) the speed of growth is influenced by genetics (strain), gender, environment, management, maintenance, quality and quantity of rations consumed.

Feed Conversion

Feed conversion is used to measure the productivity of an animal and is defined as the ratio between ration consumption and daily weight gain obtained over a certain period of time (Fadilah, 2013). The data in Table 2 shows the average feed conversion from the highest to the lowest as follows: P2 : 2.08, P3 : 2.01, P0 : 1.81, P1 : 1.79. The lower the feed conversion value, the better, this indicates that the consumption of rations consumed is more efficient in converting rations into meat. The low feed conversion value can be used as a measure of the success of ration efficiency in livestock production.

The results of the analysis showed that the treatment had no significant effect ($P>0.05$) on the feed conversion, which means that different cage densities were not able to significantly change the ration conversion. The high and low rate of ration conversion was caused by the larger or smaller difference in the ratio between the ration consumed and the gain in body weight achieved. The high rate of ration conversion indicates that the body weight gain is low, which will reduce the value of efficiency in the use of rations. According to Adil (2010), ration conversion is the ratio between ration consumption and body weight gain. Furthermore, Rasyaf (2011) states that the ration conversion is a measure that can be used to assess the efficiency of use and the quality of the ration. Conversion of ration is the ratio between the amount of ration consumed with body weight gain in a certain period of time. One measure of efficiency is to compare the amount of ration given with the results obtained either meat or eggs.

The results of Mariyam's research (2020), showed that the average feed conversion was 1.89 in broilers aged 28 days. While the average conversion rate of the results of this study was 1.90. Several factors that influence the conversion of rations according to Adil (2010) are genetics, ration quality, disease, temperature, cage sanitation, cage management ventilation, consumption and body weight gain. Other factors that also affect the conversion of rations are the provision of rations, lighting, the rate of travel of the rations in the digestive tract, the physical form of the rations and the composition of nutrients in the rations. (Fitria, 2011).

Conclusion

The conclusion of this study was the difference in the density of closed house cages in the zone near the outlet had a significant effect on daily weight gain, but had no significant effect on feed consumption and feed conversion. The cage density of 12 birds/m^2 can produce optimal daily weight gain.

References

Anggorodi, R. 1994. Ilmu Makanan Ternak Umum. Gramedia Pustaka Utama. Jakarta.

Adil. 2010. Faktor yang Mempengaruhi Konversi Ransum. Gramedia Pustaka Utama. Jakarta.

Charles, D. R. 2002. Responses to the thermal environment. In poultry environment problem, A guide to solution. Nottingham University Press, Nottingham, United Kingdom.

————. 2013. BeternakAyam Broiler. Agromedia. Pustaka. Jakarta.

Fakhrudin. 2016. Faktor yang Mempengaruhi Bobot Badan. Gramedia Pustaka Utama. Jakarta.

Faiq, U., N. Iriyanti dan Roesdiyanto. 2013. Penggunaan pakan fungsional dalam ransum terhadap konsumsi pakan dan pertambahan bobot badan ayam broiler. Jurnal Ilmiah Peternakan 1(1): 282-288.

Fitria, N. 2011. Pengaruh penggunaan ampas kecap dalam ransum sebagai substitusi bungkil kedelai terhadap konsumsi pakan, pertambahan bobot badan dan konversi pakan ayam pedaging periode grower. Skripsi. Jurusan Biologi Fakultas Sains dan Teknologi Negeri (UIN). Malang.

Homidan, A., J.F. Robertson and A.M. Petcey. 2003. Review of The efeect of ammonia dust concentration on broiler performance poultrySci. J.59 : 340-349.

Ismail, I., H.D. Utamidan B. Hartono (2013). Analisa ekonomi usaha peternakan broiler yang menggunakan dua tipe kandang berbeda Jurnal Ilmu-Ilmu Peternakan 23 (3): 11 - 16 ISSN: 0852-3581. Fakultas Peternakan Universitas Brawijaya. Malang.

Jonas, J., B. Purwanto, C. Lilis., H. Witarso dan Hindro, S. 2018. Pedoman Beternak Broiler Modern. Edisi 1. PT.Medion. Bandung

Leeson, S. dan J. D. Summers. 2001. Nutrition of The Chicken 4th Edition. University Books, Guelph, Ontarion. Canada.

Mariyam, S., Syahrio, T., Riyanti dan Dian, S. 2020. Pengaruh kepadatan kandang terhadap konsumsi ransum, pertambahan berat tubuh, dan konversi ransum broiler umur 14-28 hari di Closed House. Jurnal Riset dan Inovasi Peternakan Vol 4 (1): 35-40 April 2020 e-ISSN:2598-3067

Miles, D.M., S. L. Branton dan B.D. Lott. 2004. Atmospheric ammonia is detrimental to the performance of modern commercial broilers. Journal Poultry Science, 10(83): 1650 – 1654

Nurfaizin, L. D. Mahfudz dan U. Atmomarsono. 2014. Profil hematologi ayam broiler akibat pemeliharaan dengan kepadatan kandang dan penambahan jintan hitam (N. setivai) yang berbeda. Jurnal Agromedia.(1): 81-88.

Nuriyasa, I. M. 2003. Pengaruh tingkat kepadatan dan kecepatan angin dalam kandang terhadap indeks ketidaknyamanan dan penampilan ayam pedaging. Majalah Ilmiah Peternakan. 2(6): 40-45.

Nova, K., T. Kurtini dan Riyanti.2007. Managemen Usaha TernakUnggas. Fakultas Pertanian. Universitas Lampung. Bandar lampung.

Pereira, J. L.S. 2017. Assessment of ammonia and greenhouse gas emissions from broiler houses in Portugal. Atmospheric Pollutiongogo Research, 8(2017): 949 – 955.

Qurniawan, A. 2016. Kualitas daging dan performa ayam broiler di kandang terbuka pada ketinggian tempat pemeliharaan yang berbeda di Kabupaten Takalar Sulawesi Selatan. Thesis. Program Pasca Sarjana, Institut Pertanian Bogor.

Rahayu, I., T. Sudaryanti dan H. Santoso.2011. Panduan Lengkap Beternak Ayam. Penebar Swadaya. Jakarta.

Rasyaf, M. 2004.Beternak Ayam Pedaging. Penebar Swadaya, Jakarta.

———. 2011. Panduan Beternak Ayam Pedaging. Penebar Swadaya. Jakarta.

Renata, T. A. Sarjana dan S. Kismiati .2018. Pengaruh zonasi dalam kandang closed houseerhadap kadar amonia dan dampaknya pada kualitas daging broiler dimusim penghujan. Jurnal Ilmu-Ilmu Peternakan. 28 (3): 183–191.

Sugito., R. Erdiansyah., Azhari dan M. Isa. 2010. Pertambahan bobot badan dan waktu pembusukan daging ayam broiler yang di ekstrak dikombinasi dengan Kromium. Agripet 10 (2) : 21-26

Steel, R. G. D and J. H. Torrie. 1993. Principle and Procedures of Statistics. A Biometrical Approach. McGrawHill Book Company. Singapore.

Sujana, E., S. Darana dan L. Setiawan. 2011. Implementasi teknologi semi closed – house system pada performan ayam broiler di test farm sustainable livestock techno park, kampus Fakultas Peternakan Universitas Padjadjaran, Jatinangor. Seminar Nasional Teknologi Peternakan dan Veteriner : 362 – 366.

Sulistyoningsih, M. 2003. Respon fisiologis dan tingkah laku ayam brolier starter akibat cekaman temperatur dan awal pemberian pakan yang berbeda. Tesis. Magister Ilmu Ternak Program PascaSarjana Universitas Diponegoro. Semarang..

Wideman, R. F. S.L., D.D. Rhoads., G.F. Erf and N.B. Anthony.2013. Pulmonary arterial hypertension (ascites syndrome) in broiler. A review. Poultry Sci. J. 92 : 64-83.

Wijayanti, R.P. 2011. Pengaruh suhu kandang yang berbeda terhadap performance ayam pedaging periode stater. Skripsi. Fakultas Peternakan Universitas Brawijaya. Malang.

Woro, I. D., U. Atmomarsono dan R. Mulyani, 2019. Pengaruh pemeliharaan pada kepadatan kandang yang berbeda terhadap perfoma ayam broiler. Jurnal Sain Peternakan Indonesia. 14 (4): 418-423