

Effect of Light Intensity and Lighting Duration on Arab Chicken (*Gallus turcicus*) Feed Consumption

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Abstract:

This study aims to determine the consumption of Arabic chicken feed using differences in light intensity and lighting duration. The material of this study was 36 layer phase Arab chickens with an average body weight of 924.28 ± 90.45 g. The research method used was an experiment, with a 2x2 factorial complete randomized design. Chickens are kept for 9 weeks in the battery enclosure cage. Data were analyzed using variance test (ANOVA) with the help of Microsoft Excel 2013 Program. If data were significant that will be followed by Duncan's test. The results showed that the treatment of light intensity and lighting duration give a very significantly different effect on Arab chicken feed consumption. In general, the most efficient feed consumption is group III. The conclusion of this study is that the intensity of light and different lighting times have an impact on the differences in Arab chicken feed consumption.

Keywords —arab chicken, light intensity, lighting duration

INTRODUCTION

Feed consumption needs special attention because it is important to achieve successful development on a farm. Raising management in chicken farms greatly affects feed consumption. One aspect that needs to be considered in maintenance that affects feed consumption is housing management, one of which is lighting as a means of supporting poultry in consuming feed. Lighting can harmonize many essential factors, including body temperature and various metabolic steps that make it easier for chickens to eat and digest food. Lighting can be given through natural light, namely sunlight and can also be through artificial lighting, namely lamp. Lamps are divided into various types, namely bulb lamp, metal halide lamp, high pressure sodium lamp, and Light Emitting Diode lamp (Pringatun et al., 2011).

LITERATURE REVIEW

Lighting can be divided into three important aspects including light intensity, lighting duration and light wavelength. The intensity of light, color of light, and photoperiod (lighting time) affect the physical activity of chickens. The hypothalamus will develop with light stimulation. Light is a positive stimulant for the hypothalamus. Light emission carries electromagnetic waves which stimulate hypothalamic activity in chickens (Sulistyoningsih et al.,

2013). Light in this case the lamp is an important factor and is a breakthrough efficient lighting system to support feed consumption in Arab chickens.

There are two types of arab chicken, namely BrakelKriel Silver and BrakelKriel Golden, which are also commonly called arab silver chickens and arab gold chicken. Arab chickens have very interesting feather patterns from head to neck with long, colored hair like veils. Silver arab chicken has silvery white feathers from the head to the neck and black and white or black striated spots on the body. Gold arab chicken has a red color from the head to the neck and the color of the body feathers is red and black in color (Roberts, 2008).

Arab chicken is laying hens. In Indonesia arab chicken egg production can reach 300 eggs/head/year. Arab chicken DOC prices are more expensive when compared to Kampung chickens. Arabic chicken eggshells are white. Arab chicken has black skin and flesh so that the sales value is low. Arab chickens have almost no hatching properties, so if they are developed they need to be hatched using hatching machines or through other chickens (Natalia et al., 2005). According to Dwiyanto and Prijono (2007) the profile of arab chicken eggs in general is 42.5 g/egg egg weight, 16.0 g/egg egg yolk weight, 13.9 g/egg egg white weight, and 5.6 g/egg eggshell weight.

The maintenance phase of arab chicken is almost the same as the maintenance of laying hen, which is divided into 3

stages, namely the starter, grower, and layer phases. The starter phase, which starts from the first day, is a phase that is very vulnerable in the maintenance of laying hens or arab chickens (Risnajati, 2014). Grower phase laying hens are divided into 6-10 week age groups or initial grower phase, and at the age of 10-18 weeks are called the developer phase. The grower phase is the chicken body initial preparation for facing the laying phase. Grower phase chickens require a suitable cage density to ensure all chickens have the same opportunity to get feed, drinking water, lighting, and oxygen so that the growth of laying hens grower uniformly. Layer phase chicken is chickens that are ready to lay eggs, in the week 18 - 20 or in the middle of the fourth month (Gustira et al., 2015).

Feed consumption is the amount of feed eaten by chickens in a certain time to meet their needs for 24 hours. Feed must have balanced energy, protein, fat, vitamins and minerals so that the feed can meet the basic needs of chickens and egg production. Feed consumption is calculated based on the amount of feed consumed per day by looking at records weekly. Various factors such as body weight, temperature, environment, age, and chicken activity will affect the chicken energy needs (Leeson and Summers, 2001).

Feed consumption is the amount of food consumed by livestock used to increase body weight, maintain life and to produce. Feed consumption will increase if livestock are fed with low energy content and will decrease if livestock are fed with high energy content. Excess energy in feed occurs when the ratio of energy and protein, vitamins and minerals is too much than what is needed for normal growth, production, activity and to maintain vital functions. The average feed consumption in layer phase chickens is 768.16 g/chicken/week 109.72 g/chicken/day (Hartono and Kurtini, 2015).

Based on the description above, it is necessary to have a more in-depth scientific study of the effect of lighting duration and light intensity on feed consumption of Arab chicken (*Gallus Turcicus*).

CONCEPTUAL FRAMEWORK

The conceptual framework used in this study, as presented in the picture as follows:

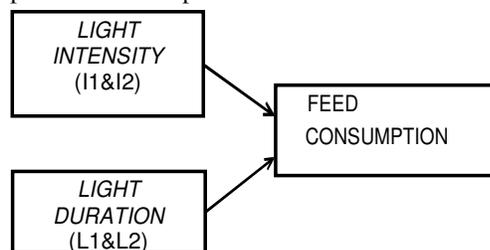


Figure 1 Conceptual Framework

Hypothesis

It is assumed there is an effect between light intensity

and light duration on feed consumption arab chicken.

RESEARCH METHODOLOGY

This study used completely randomized factorial pattern with 9 repetition. The total number of chickens used in this study was 36 Arabic chickens. Factor 1 was a group with 16 hours of lighting duration. Factor 2 was a group with 18 hours of lighting duration. Each factor used light intensity, 5 watt bulb and 5 watt LED lights. So the treatment of the group is as follows:

I1,L1 : 5 watt bulb lamp in 16h

I1,L2 : 5 watt bulb lamp in 18h

I2,L1 : 5 watt LED lamp in 16 h

I2,L2 : 5 watt LED lamp in 18 h

DATA ANALYSIS

The data were analyzed using variance test (ANOVA) with 4 treatments and 9 replications through the help of Microsoft Excel 2013 Program. If it was significantly different ($P < 0.05$) or very real ($P < 0.01$), it will be followed by Duncan's test.

RESULT

Effect of Treatment on Feed Consumption

The total consumption of Arab chicken feed for 8 weeks showed a very significant difference ($P < 0.01$). This significant difference can occur because each treatment factor has a difference in light intensity and lighting duration. The results showed that the highest total consumption average was shown by group I2L2 which was 87.73 g/chicken during the maintenance period. The lowest consumption is indicated by group I2L1 with a result of 79.24 g/chicken during the maintenance period. The results of feed consumption in this study are in accordance with the opinion of Indra et al (2013) which states that Arabian chicken feed consumption ranges from 80 to 100 g/chicken/day. Arab chicken feed consumption data due to the treatment of differences in light intensity and lighting duration are shown in Table 1.

Table 1. Feed consumption average

Treatment	Feed Consumption (g/chicken)
I1	81,53 ± 1,67 ^a
I2	83,48 ± 4,37 ^b
L1	81,20 ± 2,01 ^a
L2	83,81 ± 4,03 ^b
I1xL1	83,15 ± 3,15 ^c
I1xL2	79,90 ± 1,97 ^b
I2xL1	79,24 ± 1,00 ^a
I2xL2	87,73 ± 4,84 ^d

Information: I1= bulb lamp; I2= LED lamp; L1= 16 hr lighting; L2= 18hr lighting. Notation with different superscripts show very significant differences of influence ($P < 0.01$).

The difference in lighting duration caused a very significant difference ($P < 0.01$) between treatments. At L1 (16 hours) lighting time, the average consumption was 81.20 g/chicken. Whereas the lighting duration of L2 (18 hours) showed an average yield of total consumption of 83.81 g/chicken. According to the statement of Olenrewaju et al (2006), lighting that is too long does not necessarily produce favorable conditions, it may even be detrimental because there will be a waste of electrical energy. This shows that longer lighting times are not necessarily better in Arabian chicken egg production. This is consistent with the results of this study which showed that Hen Day Production between L1 and L2 shows results that are not significantly different.

The difference in light intensity caused a very significant difference ($P < 0.01$) between treatments. On the intensity of light I1 (bulb lights, the average yield of total consumption of chicken is 81.27 g/chicken. Whereas the intensity of light I2 (LED light), the average yield of total chicken consumption is 83.70 g/chicken. These results occur because LED lights have better light power so arab chickens can see feed more clearly and are able to consume more feed. This is inversely proportional to the study of Liu et al (2015), LEDs increased group uniformity, but reduced feed intake and chicken mortality. But in this study it was known that the hen day production and egg weight between bulb (I1) and LED (I2) lights also showed results that were not significantly different. The use of LED lights will only be more efficient because it is an energy saving lamp.

Arab chicken feed consumption every week due to the treatment of differences in light intensity and lighting duration is shown in Figure 5.1. The average consumption in each treatment has shown differences since the 3rd week of maintenance. The graph shows that the average feed consumption increased in each group at week 3 and began to decline at week 5.

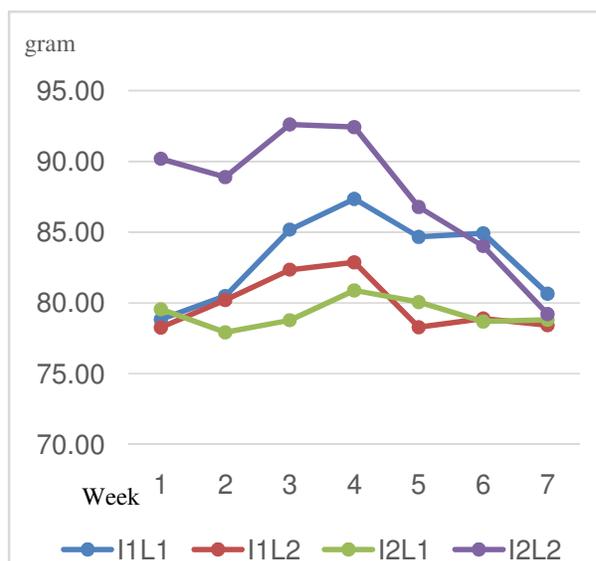


Figure 1. Weekly average feed consumption (g/chicken)

The I2L2 group had the highest total consumption yield of 87.73 g/chicken and the peak of feed consumption occurred at the 3rd week. This happens because the light was given for 18 hours per day so that arab chickens in this group were able to consume feed longer. In addition, LED lighting is important for arab chickens because it has a higher lux level compared to bulb lamp. This is in accordance with the study of Agam et al in 2015 which stated that the average intensity of lighting of 5 watt LEDs was the highest compared to bulb and fluorescent types. The luminous efficacy value of LED lights is also the highest so that the discharge energy is the lowest. The energy from the light bulb is the most inefficient. This shows that the 5 watt LED lights have the greatest energy efficiency compared to 5 watt fluorescent lamps and 5 watt bulb lamps.

In this study, group I2L1 showed the lowest total yield of consumption of 79.24 g/chicken. This happens because light was given for 16 hours per day so that arab chickens in this group were unable to consume feed for longer. However, these results prove that using LED lights is more effective because it has efficiency in removing electrical energy and arab chicken feed consumption is approaching the normal average per day consumption of 80 g/chicken/day.

In addition to the duration of lighting and light intensity that affect feed consumption, the provision of feed types will greatly influence the palatability of chickens in consuming feed. This study uses 324 KJ laying hens complete from PT. Charoen Pokphand Indonesia. Feed consumption is influenced by levels of nutrients in rations such as protein, fat, crude fiber, vitamins, and minerals. The needs of poultry ration substances depend on intrinsic

factors such as poultry species, type, nation, class, strain, gender and age (Achmanu and Muharlien 2011).

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The conclusions obtained from the results of this study are the intensity of light and different lighting times have an impact on feed consumption. The most efficient feed consumption is shown by the 16 hour bulb lamp group.

Suggestions

Based on the results of this study, it is necessary to do further research on the addition of light intensity to both bulb lamps and LED lights by using different light intensities from various types of lights. Then at different lighting times, more varied research needs to be done, such as the addition of 12 hours and 14 hours of lighting time difference. Feeding in the middle of the night is also an alternative study so that the provision of light at night with a long time becomes more effective. In addition, in terms of economics, further research is also needed.

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