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Correlation Between Body Weight Day Old Chick (DOC) and Body Weight Each Week from Commercial Farms in Province of Rizal, Philippines

Korelasi Berat Badan Day Old Chick (DOC) dan Berat Badan Setiap Minggu dari Peternakan Komersial di Provinsi Rizal, Filipina

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ABSTRACT

Farmers of the poultry industry are seeking new and more efficient techniques to produce broilers more quickly, without sacrificing quality, nutrition, or cost, as the demand for poultry rises in conjunction with the human population. This study analyzed the weight of broilers from day 1 to harvest day to determine the impact of each daily or weekly weight on the final weight of the broilers. The experiment was conducted in a conventional type of housing. One hundred thousand male Cobb strain day-old chicks were housed. The feed of the chicks consisted of commercially blended feeds including CP and BMEG, as well as vitamins, minerals, and amino acids, in accordance with nutritional needs. The study examined the relationship between the day-old chick's weight and the flock's weekly weight and discovered that there is no correlation between the day-old chick's weight and its weekly weight at days 7, 14, 21, 28, and 35 (harvest weight). However, the weight at the 7-day mark had the greatest effect on the potential market weight of the broiler. It can be determined that the early life of chickens plays a crucial role in their productivity.

Key words: Broiler, Harvest Weight, Performance, Correlation

ABSTRAK

Peternak industri perunggasan mencari teknik baru dan lebih efisien untuk memproduksi ayam pedaging lebih cepat, tanpa mengorbankan kualitas, nutrisi, atau biaya, karena permintaan unggas meningkat seiring dengan populasi manusia. Penelitian ini menganalisis bobot ayam pedaging dari hari ke-1 hingga hari panen untuk mengetahui pengaruh bobot harian atau mingguan terhadap bobot akhir ayam pedaging. Percobaan dilakukan di rumah tipe konvensional. Seratus ribu anak ayam galur Cobb jantan berumur sehari ditempatkan. Pakan anak ayam terdiri dari pakan campuran komersial termasuk CP dan BMEG, serta vitamin, mineral, dan asam amino, sesuai dengan kebutuhan nutrisi. Penelitian ini meneliti hubungan antara bobot anak ayam umur sehari dan bobot mingguan kawanan dan menemukan bahwa tidak ada korelasi antara bobot anak ayam umur sehari dan bobot mingguannya pada hari ke 7, 14, 21, 28, dan 35 (bobot panen). Namun, bobot pada tanda 7 hari memiliki pengaruh terbesar pada potensi bobot pasar broiler. Dapat ditentukan bahwa awal kehidupan ayam memainkan peran penting dalam produktivitas mereka.

Kata kunci: Ayam pedaging, Bobot Panen, Performa, Korelasi

INTRODUCTION

In the Philippines, poultry production is one of the major industries under the Bureau of Animal Industry. It is the fastest-growing livestock sector, especially in developing countries (Conroy *et al*. 2005). Chicken raised for meat consumption are called broilers or broiler chicken which originated from the jungle fowl in the Subcontinent of India (De Jong *et al*. 2012). From the old practice of growing, the modern livestock industry learned to improve their production by raising them in an intensive setting to reach efficient feed conversion and high levels of production.

Calabarzon is the second top chicken meat producer in the country. Among the top provinces which contribute to the production of chicken is Rizal (PSA 2017). The Philippines Statistic Authority (2018) reports that the poultry farmers had an oversupply in the first three quarters of the year and that the chicken population is estimated to be 184.34 million. It is one of the fastest and major producers of meat and has been a significant contributor to the agricultural sector. As observed worldwide, chicken meat consumption has a greater increase in demand compared to other meats because of its many benefits such as lower price, lower fat content, and more convenient and diverse meal preparation methods (Landes *et al*. 2004).

Poultry meat has grown and made affordable due to its demand for an alternative human source of protein. Thus, commercial farm owners continuously improve the nutrition and particular traits of broilers to attain a faster growth weight program. Nowadays, raising broilers is under an intensive production system to achieve high productivity and high economic efficiency associated with meat quality (Nunes 2004). The broiler industry in the country has an optimistic performance because of the continuous increase in demand for this type of meat, along with the fast growth of the population and income growth (Chang 2007). Several studies have been conducted about the relationship between 0-day-old chick until harvest weight. In the studies conducted by Barratto *et al*. (2009), chicks have greater feed conversion than older chicks. On the other hand, fasting had a negative effect on feed intake in the period of 0 to 10 days of age. Meanwhile, the birds from older breeders have a greater feed conversion from age 21 to 35 days whether they were subjected to a fasting period or not.

Another study that can affect broiler performance is the litter material (Mendes *et al*. 2011). After experimenting, they found out that it did not affect broiler performance, but instead increased the occurrence of footpad lesions. With an incidence of poultry, diseases greatly affect the growth and development of broiler. Using feed additives such as antibiotics, probiotics, organic acid, and vitamin C showed great improvement in the prevention of disease, growth promoters, and improved performance (Camacho *et al*. 2017). As a result, several factors have been shown to cause faster growth, larger and more efficient feed conversion, and disease resistance before the broiler attains its market weight. Some studies suggest that it is the result of urbanization and growth of income.

This study aims to examine the relationship between the day-old chick's weight and the flock's weekly weight at days 7, 14, 21, 28, and 35 (harvest weight). This study can be useful in maximizing farm production with minimum cost. It will also help in the improvement of the commercial broiler industry in the Philippines.

MATERIALS AND METHODS

Broiler Program Records

The weight of the batch sample from the Broiler Program Record of NDL farms from January 2016 to December 2018 was collected, analyzed, and used in this study. These samples were put in a graph to compare the age of harvest time of each cycle. In three (3) years, 6 cycles of chicks were studied per year. Each cycle had an estimated count of 100 000 chicks for a total of 1.8 million Cobb strain chicks being observed as subjects of the study. The day-old chicks were housed in a conventional type of housing and raised for 35 days

Growth Management

Commercially mixed feeds of Charoen Pokphand (CP) and Black and Minority Ethnic Group (BMEG) were used in the experiment. Diet was formulated according to the nutrient requirements for booster, broiler, and broiler finisher rations. All diets were fortified with vitamins, minerals, and amino acids to provide the additional nutritional requirements of broilers.

Individual body weights of chicks were measured at day-old age (DOC). The weekly body weight (7-day, 14-day, 21-day, 28-day, and 35-day) of broilers was calculated and recorded. The chicks were reared under the standard growing conditions using a conventional type of housing and raised for 35 days. Standard commercial broiler feeds were used in the experiment where all birds had ad libitum access to feed and water. Continuous (24 hours) lighting was used throughout the growth period.

Statistical Analysis

All data were subjected to Kendal Tau and Spearman Correlation at a $P<0.05$ level of significance. Kendal Tau is used to check the strength of dependence between the average weekly body weight of birds. While Spearman correlation is used to measure the degree of association between average weekly gain.

RESULTS AND DISCUSSION

This study was done to evaluate the correlation between the weight of the daily old chick and their weekly weight (day 7, day 14, day 21, day 28, and day 35). The average weight per week per cycle is presented in Table 1. Tables 2 and 3 presented the degree of association and the strength of dependence between weekly weight, respectively. There was no significant causal relationship ($P<0.05$) between the weight of the 0-day-old broiler and its growth rate until harvest weight. Except for 0-day-old broilers, 7-day-old broiler weight exhibited a positive connection in all age categories. The same results were seen on days 14, 21, 28, and 35 in all age groups.

Table 1. Mean weight in grams of broilers

Age of Boiler	Weekly weight
0-day old	41.59±0.77ns
7-day old	154.78±20.33s
14-day old	395.97±74.78ns
21-day old	787.72±126.99ns
28-day old	1331±195.08ns
35-day old	1815±134.60ns

Note: Means in the same column with different superscripts significantly differ (P<0.05) ns: not significant; s: Significant

Table 2. Degree of association between the average weekly weight (g)

Age of Boiler	Weekly weight
0-day old	41.59±0.77*
7-day old	154.78±20.33accc
14-day old	395.97±74.78aab
21-day old	787.72±126.99ab
28-day old	1331±195.08b
35-day old	1815±134.60

Note: Means in the same column with different superscripts are significantly differ (P<0.05) by the weekly weight of broilers

a: positive moderately correlated; b: positive weakly correlated; c: positive very weakly correlated; *: not correlated

Table 3. Strength of dependence between an average weekly weight (g)

Age of Boiler	Weekly weight
0-day old	41.59±0.77*
7-day old	154.78±20.33bccc
14-day old	395.97±74.78bac
21-day old	787.72±126.99ac
28-day old	1331±195.08b
35-day old	1815±134.60

Note: Means in the same column with different superscripts are significantly differ (P<0.05) by the weekly weight of broilers

a: positive moderately correlated; b: positive weakly correlated; c: positive very weakly correlated; *: not correlated

At a 5% significance level, statistical analysis revealed no significant causal correlation between day-old chicks and weekly body weight. Day-old chicks weigh 40-42g, which can be observed in Table 1. This signifies that the weight of week 0 on the farm does not affect the performance of day-old and 35-day. This phase started with healthy chicks as the beginning point for good broiler performance. Traditional grading of broiler chick is done visually and inspection of physical damages. The day-old chick weight has limited value as an indicator of overall quality, as it is correlated with egg weight rather than chick development (Farhadi *et al*. 2014; Kalia *et al.* 2017) Hence, day-old chick weight includes both the actual chick weight and the weight of remaining yolk residue. Another method of checking the chick quality can be based on the qualitative score of Pasgar score and the potential rate of chick survival (van de Ven *et al*. 2012; Oliveira *et al*. 2020). These parameters are used to ensure the proper development of chicks to attain the potential weight in their first 7 days.

The body weight is the most widely used parameter for assessing 0-day-old chick quality. However, the observed differences in hatchling weight may have been mainly affected by initial egg weight. (Boerjan 2002; Decuypere *et al*. 2002). Although contradictory results about the relationship between day-old chick weight and broiler performance (Tona *et al*. 2003), it is generally accepted that chick weights may be related to 35-day weight performance. Among all the quality measures tested, body weight at 7-day of age exhibited the greatest predictive value for body weight at 35-day age (Willemsen *et al*. 2008)

The first seven days represent almost 17% of the total growing cycle making it a crucial period to build the foundation for maximizing their future physical performance (Nitsan *et al*. 1995; Sacranie 2019). The 17% growth happens during the brooding period of the chicks, which can increase the body weight by approximately 50 times within 35 days of age (Liliburn 1998; Ketali *et al*. 2007). This period is where the foundation of the overall capacity of body protein deposition through (broiler) productive life. At this age, the body builds the foundation for the broiler's entire performance. Day-old-chick needs to eat and drink as soon as they are confined; flocks that do not make a rapid transition to feed and water may lead to early mortality rates (Giersberg *et al*. 2021). Feed and water consumption should be stimulated during their first few days to maximize gut growth and give chicks the maximum start. First feeding time affects growth performance from the perspective of intestinal enzymes (Wang *et al*. 2018). Furthermore, a balanced diet and nutritional intervention must be ensured to keep a healthy gut for the flock.

At 7-day old, it weighed 86 – 220 g with a mean weight of 154.86 g. Week 1 has a positively moderately correlation with week 2 and week 5. This means the weight on week 1 has a great effect on the performance weight in week 2. This phase is where the broiler chicken develops their potential growth to achieve its target weight per week up to its market weight. In the study by Kenyon (2019), he reported that the first seven days of broiler chicks have a vital role in the flock's performance. This duration is critical since it focuses on the aerial breathing of the housing, thermoregulation, and feed transition of broilers. Since all of the farms are in a conventional setup, the performance of each week per cycle differs from each cycle and farm. Raising broilers in a conventional setup resulted in different weekly weights on each farm. These differences can be improved by raising broiler chicken in environmentally controlled conditions. Broilers grown in a modernized, environmentally controlled setting had a higher weekly gain, as well as a higher production efficiency index and lower mortality per cycle (Dawkins *et al*. 2004; Amaral *et al*. 2011). Because of the short life cycle of broiler chickens, growth and development during the brooding period are important. However, the current study documented the ideal body temperature for broiler chickens. (Nascimento *et al*.

2014). In practice, it has been established that during the brooding phase, a body temperature of 40.0 – 41.0 °C is optimum and results in the best growth and development. Broiler chickens have normal eating, drinking, and sleeping behavior at this temperature.

According to management guidelines for the modern broiler, the birds are supposed to increase their live weight 4.25 times during the first 7 days, from approximately 40 g to 180 g. In the study by Butcher and Nilipour (2019), they reported chicks must be at least 4.5 times their weight. Thus, a significant increase in carcass conformation, particularly breast-muscle 10 development, relies on the number of muscle cells. This number tends to be fixed within the chick's first few days post-hatch (de Jong *et al*. 2020). Additionally, the development of the gastrointestinal tract during the 7 days old of a chick contributed to the growth rate of the total body (Sell *et al*. 1991; Uni and Ferket 2004). Early feeding has been demonstrated to have a good impact on the gastrointestinal tract's growth, development, and maturity, as well as the chicken's overall health. (Noy and Sklan 1997; Batal and Parsons 2002; Uni and Ferket 2004). As a result of these improvements, the final performance of the broiler is better and can achieve the target 35-day weight in a shorter period. This is also expressed by the positive relationship between body weight at 7 days of age and body weight at 35 days of marketing age (Nir and Levanon 1993; Gonzales *et al*. 2003).

The weight of a 14-day-old broiler in this study is 230 - 888 g, with a mean of 395.97 g, as presented in table 1. In the study conducted by Agric (2021) and Virbac (n.d), broilers with the age of 14 days have an average weight of 400 - 500 g, or 2.6 times the 7-day weight (Butcher and Nilipour 2019). But their studies showed an unclear relationship why the weight of week 2 has a moderate correlation with week 3 and week 4. The same goes for week 5, which resulted in a positively weak correlation. The broiler usually grows rapidly during the first two weeks of life. This growth is related to the utilization of feed efficiency and is used for economic phase feeding of commercial stock by matching the nutrients requirement of broilers during this age for their growth and development (Jha *et al*. 2019).

In this study, the weight of a 21-day-old broiler is 597 up to 1330 g with a mean of 787.72 g, as presented in Table 1. The results of the study of the 21-day-old broilers have a moderately positive correlation with 28-old broilers and a weak positive correlation with 35-day- old broilers. The results per farm are within the range of 779 g (Agric 2021) up to 850 (Virbac n.d.) or as high as 2.0 pounds or 907.18 g (Butcher and Nilipour 2019) at a 21-day old of broiler. No studies have been established regarding the correlation of 21-day-old broilers with 35-day-old broilers.

The weight of the 21-day-old broiler in this study is 1300 up to 1800 g, with a mean of 1331 g as presented in table 1. The study resulted from the 28-day-old broilers having a moderately positive correlation with 28-old broilers and a weak positive correlation with 35-day- old broilers. The results per farm are within the range of 1400 (Virbac n.d.) up to 1421 g (Agric 2021) or as high as 3.3 pounds or 1500 g (Butcher and Nilipour 2019) at a 28-day- old of broiler. No studies have been established regarding the correlation of 28-day-old broilers with 35-day-old broilers.

The weight of a 35-day-old broiler in this study is 1330 - 2053 g with a mean of 1815 g, as presented in Table 1. The results per farm are within the range of the targeted weight of 1980 g (Virbac n.d.), 2041 (Butcher and Nilipour 2019), and 2062 g (Agric 2021). But it is noted on some farms that their weight is below the market weight. Poor quality day-old chicks, inferior growth performance, poor nutritional requirements, improper caretaker management, and poor environment and facilities of broiler farms might contribute to the batch with a lower market weight. (Marchini *et al*. 2016; Dawkins *et al*. 2004).

CONCLUSION

The weight of a 0-day chick has no causal relationship with days 7, 14, 21, 28, and 35. The weight of 7-day has the most significant impact on broiler market weight potential. It can be determined that the early life of chickens plays a crucial role in their productivity. It is highly recommended that further studies be done on day-14, 21, and 28 to establish a correlation to day 35 in order to maximize the growth rate of broilers. Also, the use of visual score factors such as navel quality, leg firmness, beak size, eyes, vital and alert chicks, and chick length may be recommended as an acceptable method for determining high-quality chicks.

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