UTILIZATION OF MALE LAYER CHICKENS (BOVANS WHITE AND ISA BROWN) FOR MEAT PRODUCTION UNDER FREE-RANGED SYSTEM

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ABSTRACT

The declining chicken meat production in the Philippines poses a great threat to food security in the country. However, male layer chickens are usually overlooked as an additional source of poultry meat. Hence, the study examined a total of 500 males of two commonly used layer chicken genotypes, ISA Brown (IB) and Bovans White (BWh), for their performance in meat production and profitability to be raised under a free-ranged system. Chickens were randomly distributed to 10 houses with ranging areas. The guidelines set by Philippine National Standards for Free-Ranged Chicken (PNS/BAFS, 2018) were adopted. Growth performance data were collected twice a month. At 90 days, five chickens per house were randomly selected to assess the carcass traits. Overall (d 1 to 85), IB has significantly higher ADG and lower ADFI that resulted in better feed-to-gain than BWh. Breed-dependent differences were also evident in carcass traits. Moreover, both BWh and IB had positive margins over feed cost. In conclusion, IB and BWh can be valuable sources of meat and raising these chickens under a free-ranged system can be a profitable business venture.

Keywords: layer cockerels, free-range system, growth performance, carcass characteristics

INTRODUCTION

The annual volume of chicken production in the Philippines is declining from 2019 to 2021 (PSA, 2022). However, there is a continuous growth in demand for chicken meat (Choo *et al*., 2014). To close the gap between supply and demand, additional sources of chicken meat should be addressed. There is an estimated 44M heads of male layer chickens quarterly (PSA, 2022) that are being wasted and these chickens can be tapped as an additional source of meat. Since egg production and growth rate are negatively correlated (Buzala and Janicki, 2016), male layer chicks are culled immediately after hatching. In the Philippines, day-old commercial strains of male layer chickens are usually grounded and used as livestock and pet feeds, served as a fried delicacy in streets, or sold as dye-soaked pets for children during festivals. These practices can cause ethical issues among consumers and can be challenged

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under the animal welfare act. One of the most promising alternatives for these ethically wrong practices and to increase the supply of chicken meat is to grow male layer chickens.

Rearing male layer chicks for meat is not a new concept, and there are several researches in other countries that were conducted to explore the utilization of male layer chickens for meat production (Gerken *et al*., 2003; Lichovníková *et al*., 2009; Choo *et al*., 2014; Giersberg and Kemper, 2018; Mueller *et al*., 2018; Mueller *et al*., 2020; Murawska *et al*., 2019; Popova *et al*., 2022). However, under the intensive system, raising male layer chickens will have a higher operating cost that is caused by a long rearing period and low feed efficiency (Murawska *et al*., 2005). Offering the meat from layer cockerels into a niche market and producing it in an alternative system, such as free-range or organic, can suitably increase the profitability of rearing layer cockerels for meat production (Giersberg and Kemper, 2018). In addition, the free-ranged system addresses the concern about the animal welfare of the male layers since it provides an environmentally friendly and sustainable approach that allows the male layers to obtain their optimum health and maximum performance in consideration of their welfare (Fanatico *et al*., 2008).

Due to the lack of data on rearing male layer chickens in the Philippines, this study was designed to determine the growth performance and carcass characteristics of male cockerels from two commonly used commercial layer strains of male layer chickens (Bovans White and ISA Brown) raised under free-range production system within a 90-day trial. The profitability of rearing male layer chickens under a free-range production system was also accounted for in the study through the income over feed cost analysis. Furthermore, the study serves as benchmark data that can be used by different sectors when considering rearing male layer chickens as a profitable business venture.

MATERIALS AND METHODS

The study was in accordance with the Institutional Animal Care and Use Committee of UPLB (approval no. CAFS-2021-010). A total of 500 birds of two different commercial layer strains were investigated. The strains were Bovans White (BWh) and ISA Brown (IB). All management practices and feed composition strictly adhered to the guidelines set by the Philippine National Standards (PNS/BAFS, 2018) for Free-Ranged Chicken. Chicken houses and range areas were constructed with a stocking density of six birds/m^2 and one bird/m^2, respectively. Chickens were randomly distributed to 10 houses with a range area. Outdoor access to the range area was provided during daylight hours after 15 days of age. And birds were confined to indoor pens at night.

Birds had free access to feed and water ad libitum (both in the range area and in-door pens). All cockerels received the same diets (Table 1) (1–30 days: commercial booster crumble; 31 to slaughter: commercial grower crumble). The weight of cockerels and commercial feed was determined biweekly for calculating weight gain, feed intake, and feed-to-gain ratio (F/G). Weight gain and F/G were adjusted for mortality. At 90 days of age, five birds per pen were sacrificed to evaluate the carcass performance. The birds were killed by manual exsanguination. Furthermore, birds were scalded, defeathered, eviscerated, and chilled using an ice bath at 12^{O}C for 15 min. After weighing the carcass, major cut-up parts were separated and the yield of breast, wings, legs, and back was recorded. The yield was computed as a percentage of carcass weight. Legs and wings were further dissected, and the yield of separable lean, fat-and-skin, and bone was determined. Data on growth and carcass

Table 1. Chemical composition of the commercial booster and grower crumble.

Composition	Booster	Grower
Moisture, %	8.91	10.50
Ash, %	18.98	19.27
Crude Protein, %	22.15	17.30
Crude Fiber, %	1.83	2.83
Crude Fat, %	5.69	3.50
Nitrogen Free Extract, %	42.44	45.20
Calcium, %	0.87	1.20
Phosphorus, %	0.66	0.20

performance were analyzed using T-test in RStudio (RStudio Team, 2020). Significance was set at $P \leq 0.05$.

The profitability of rearing male layers under a free-ranged system was determined using income-feed cost analysis. Feed cost per chicken was computed by multiplying the total feed consumed by the price per kilogram of feed. The value of gain per chicken was calculated by multiplying the total weight gain by the live weight price per chicken. Feed cost per kilogram of gain was computed by dividing the feed cost per chicken by the total weight gain. And lastly, margin over feed cost (MOFC) was computed by subtracting the feed cost per chicken from the value of gain per bird.

RESULTS AND DISCUSSION

The growth performance (Figure 1) of ISA Brown (IB) is significantly superior to Bovans White (BWh) ($P<0.05$). The body weight (BW) of the two commercial strains diverged significantly starting from 43 d and maintained until 85 d, where ISA Brown had significantly heavier BW than Bovans White. This trend is also observed in their female counterparts raised in an intensive system. At 85 – 91 d, female ISA Brown (1.20 kg) will have higher body weight than Bovans White (1.00 kg) (ISA, 2022a; ISA 2022b). Furthermore, the BW development of male IB and BWh is slower than that of fast-, and slow-growth broilers. Depending on the diet, chickens can be classified into fast-growth broilers at 42 – 49 d which can reach 2.50 kg; and medium-growth and slow-growth broilers at 56 – 84 d which can reach 2.50 kg (Gordon and Charles, 2002). This demonstrates the intense genetic programming of these commercial strains, which directs energy toward egg production rather than the accumulation of body tissue (Mueller *et al*., 2018).

ISA Brown had significantly higher ($P<0.05$) ADG from 30 to 57 d and overall ADG than Bovans White. IB exhibits the highest ADG during the 44 – 57 d and gradually decreases over time. On the other hand, BWh exhibits the highest ADG during the 58 – 71 d but showed a downward trend over time. It is hypothesized at the age of 57 d and 71 d, the growth of IB and BWh, respectively, might have reached the inflection point. Generally, the growth curve in poultry has the following phases: an accelerating phase, decelerating growth phase, and a plateau phase (asymptotic mature weight) (Fitzhugh, 1976; Segura-Correa *et al*., 2017). One of the key parameters in the growth curve is the inflection point. At this stage,

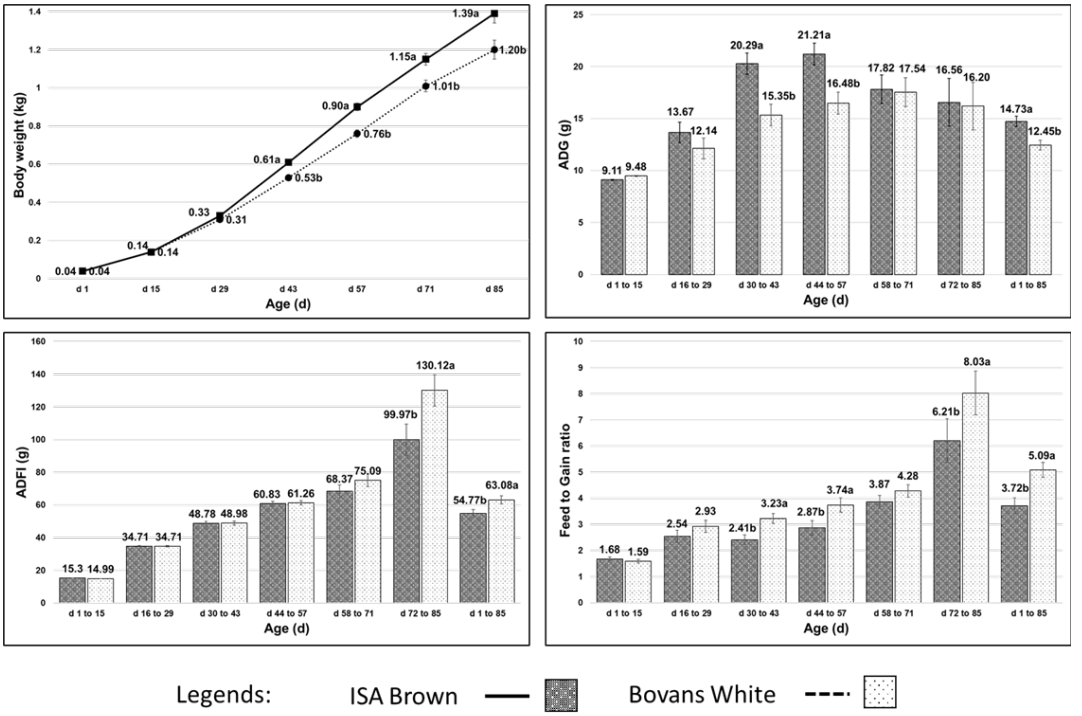

Figure 1. Growth performance of ISA Brown and Bovans White raised under free-ranged system.

*Mean ± Standard Error Bar

[ab]Means with different letters are significantly different (P<0.05)

ADG – Average daily gain, ADFI – Average daily feed intake

the animal reached its maximum growth rate. Inflection points are used to determine the optimum age to harvest animals. Inflection points are shifted to a younger age when a breed or strain were selected for high body weight and increased relative growth rate (Narinc *et al*., 2017).

The average daily feed intake (ADFI) of both strains increased as they age since their nutritional requirements also increased. Additionally, a significant difference (P<0.05) in the average daily feed intake between the two strains was observed specifically on day 72 – 85 d which also significantly (P<0.05) affected the overall mean of the ADFI of both strains from 1 – 85 d. In this study, BWh had higher ADFI than IB which is in contrast with the trend in their female counterparts. At 85 – 91 d, female ISA Brown (67.0 g) will have higher ADFI than Bovans White (56.0 g) (ISA, 2022a; ISA 2022b). Furthermore, Bovans White had a significantly higher (P<0.05) feed-to-gain ratio (F/G) compared to ISA Brown. This trend is a result of the high ADFI, but low ADG. This trend indicates that the BWh was not able to efficiently convert its feed intake into nutrients that would enhance its growth and performance as compared to the IB. Differences in feed intake and feed conversion can be attributed to the varying ranging ability of the birds (Fanatico *et al*., 2008). However, in the last weeks of the experiment, the high ADFI might be due to the feed wastage behavior of the chickens; and this indicates that feeding management might have to be modified to prevent feed wastage (Mueller *et al*., 2020). Therefore, the values for the ADFI and F/G might have been overestimated for both strains.

Overall, the carcass performance (Table 2) of ISA Brown was significantly better (P<0.05) than Bovans White. The dressing percentages of IB and BWh were within the range of values for slow-growing chickens (59 to 69%) (Popova *et al*., 2022). In a longer rearing period, the dressing percentage of the male layer chickens is not significantly different from broilers (Murawska and Bochno, 2007; Choo *et al*., 2014). Visual characteristics of the breast, such as its size and shape, are one of the important marketing criteria (Mueller *et al*., 2018). The proportion of breast and legs in male layers also differs from that in broilers. In male layer chickens, the percentage of the breast varied from 14 – 26% whereas that of legs ranged between 24 – 35% (Popova *et al*., 2022). Dual-purpose chickens and male layers have smaller breast meat weights and proportions compared to broilers (Gerken *et al*., 2003; Popova *et al*., 2022). In the current study, breast yield was not significantly different (P>0.05) between IB and BWh. The male layers are usually having a high percentage of legs compared to broilers (Gerken *et al*., 2003; Popova *et al*., 2022). In the current study, leg yield was significantly higher (P<0.05) in IB than BWh. Further dissection of the leg part reveals that IB had a higher %bone while BWh had higher %lean. Free-ranged system offers unlimited access to the range area which can enhance bone development, and decrease leg weakness problems (Mikulski *et al*., 2011).

The genotype-dependent differences in terms of growth and carcass performance between the two strains can be attributed to the breeding objective and the parental breeds that were used for developing these two commercial strains. Bovans White was developed

Table 2. Carcass characteristics of ISA Brown and Bovans White raised under free-ranged system.

Characteristics	ISA Brown	Bovans White	SEM
Slaughter Weight, kg	1.57[a]	1.36[b]	0.05
Carcass Weight, kg	1.11[a]	0.90[b]	0.04
Carcass Yield, %	70.45[a]	66.02[b]	1.05
Breast, %[1]	23.08	23.85	0.36
Legs, %[1]	31.37[a]	30.37[b]	0.22
Wings, %[1]	14.28	14.13	0.20
Back, %[1]	31.26	31.64	0.28
Breast components, %			
Lean	59.21	58.60	1.39
Fat and Skin	12.78	13.75	1.01
Bone	28.01	27.65	1.17
Legs components, %			
Lean	60.34[b]	62.86[a]	1.11
Fat and Skin	9.72	10.30	0.55
Bone	29.94[a]	26.84[b]	1.22

[1]Based on the carcass weight of the chickens

[a,b]Means with different superscript are significantly different (P<0.05)

using White Leghorn; and on the other hand, ISA Brown was developed using Rhode Island Red. The White Leghorn and Rhode Island Red are considered egg-type and dual-purpose breeds, respectively. In general, males from dual-purpose breeds have better meat production traits than males of egg-type breeds (Mueller *et al*., 2020; Popova *et al*., 2022).

Feed cost accounts for 70 to 80% of the total production cost in poultry production. Hence, the margin between the returns and the feed cost (Table 3) can be used to measure the profitability of raising male layer chickens under a free-ranged system. A MOFC greater than 1 means that the production is profitable. ISA Brown and Bovans White garnered a high positive value for MOFC, Php 133.19 and Php 74.75, respectively.

Raising ISA Brown and Bovans White under a free-ranged system is not only a profitable business venture but also a major source of animal-based protein for Filipinos. With the looming food security crisis, the raising of layer cockerels will be an effective tool in ensuring food is served on the table and additional income for the farmers.

Table 3. Income over feed cost analysis of ISA Brown and Bovans White raised under free-ranged system.

Breed	ISA Brown	Bovans White
Feed Cost per Bird, Php	154.09	170.81
Value of Gain per Bird, Php	287.28	245.60
Feed Cost/kg Gain, Php	118.50	153.15
Margin over feed cost, Php	133.19	74.79

Assumed liveweight price = Php 200/kg

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