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Growth performance and meat quality of broiler chickens (*Gallus gallus domesticus* L.) reared under different raising systems in the Philippines

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Abstract Broilers in the intensive system exhibited the highest daily gain and body weight, while those in the free-range system found to be the lowest. Significant differences were observed among treatments ($p<0.05$), except between the semi-intensive and free-range systems ($p>0.05$). The feed conversion ratio (FCR) was best in the intensive system and poorest in the free-range system, with significant differences between these two ($p<0.05$). Dressing percentage was highest in the intensive system and lowest in the free-range system, with no significant differences among treatments. The pH and water-holding capacity (WHC) of breast meat were highest in the intensive system and lowest in the free-range system, with significant differences in pH at 45 minutes and 24 hours ($p<0.001$). Moisture content was highest in the semi-intensive system and lowest in the intensive system, with no significant differences ($p>0.05$) among treatments. Ash content was highest in the free-range system and lowest in the semi-intensive system, with no significant differences ($p>0.05$) observed. Protein content was highest in the free-range system and lowest in the intensive system, while fat content was highest in the intensive system and lowest in the free-range system, with no significant differences ($p>0.05$) in fat content among treatments.

Keywords: Broiler, Dressing percentage, Growth performance, Meat quality, Raising system

Introduction

The majority of Southeast Asian nations, including the Philippines, broiler chicken is a popular protein source. This is brought on by the rise in animal protein consumption. Broiler chickens have recently been chosen primarily for their higher meat production, which is demonstrated by traits like a decent dressing percentage, a potential substantial amount of meat per carcass, a noticeable growth rate, and an ideal fat distribution. Numerous biological and non-genetic factors, as well as genetic factors, influence these desirable characteristics (Chang, 2007).

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The majority of broiler populations are raised in confined environments, which has led to a notable rise in productive efficiency and the financial success of the production of broilers business (Gržinić *et al.,* 2023). The use of fast-growing broiler breeds to optimize efficiency results in high yields, rapid turnover, low production costs, high profits, and low risk, which is beneficial to farmers. However, the birds experience elevated levels of stress as a result of the intensified raising system, making them more vulnerable to illness. (Dozier *et al.,* 2005). The intensified system additionally contributes to biochemical meat anomalies, such as watery meat, frequent lack of flavor, and excessive fat content in chicken meat. (Pavlovski *et al.,* 2009).

This leads to the introduction of alternative systems (semi-intensive and free-range) in broiler production. Rearing broiler chicken under these systems involved the prohibition of synthetic substances for growth, and providing chickens access to a natural environment, improves bird condition, contributes to the lower lipid content in chicken meat (Mikulski *et al.,* 2011) and pasture intake improves the meat quality (Castellini *et al.,* 2002). Even though broiler is known as fast-growing broiler strains and has the low adaptive capacity to extensive systems, there are still existing countries that adopt this method of raising broilers due to economic reason, as it offers opportunities for small-scale farmers to infiltrate the market and provide a quality product for consumers (Alvarado *et al.,* 2005). The alternative systems mainly use medium and slow-growing chickens (Cocjin *et al.,* 2003), which are more adaptable to the external environment than fast-growing chickens. However, they grow slowly and need a suitable feed conversion ratio compared to fast-growing commercial broilers.
Currently, findings comparing the performance of intensively raised, quickly growing broilers with those produced on alternative systems are conflicting and inconsistent (Bartlett *et al.,* 2005). These results, which include higher breast and drumstick percentages, lower abdominal fat, improved sensory quality, and higher TBA-RS (Thiobarbituric Acid Reactive Substances) levels in organic systems (Castellini *et al.,* 2002), as well as the impacts of genotype and production system on meat color, protein content, and tenderness (Fanatico *et al.,* 2005), also examine how these systems affect the meat that comes from broilers. Additionally, a previous piece of information from Adokiye and Beatrice from 2012 is taken into account in the equatorial climate. However, it is only capable of comparing how quickly broiler chickens develop in various systems.

The goal of this study was to ascertain how broiler chickens responded to various tropical raising practices with regard to their growth performance and their meat's physico-chemical characteristics.

Materials and methods

The Animal Welfare Act 8485 of the Philippines was observed in every component of this study's handling of animals. The study was conducted at Purok-6, Barangay Poblacion, Naawan, Misamis Oriental, with coordinates of 8°25'38.2"N and 124°17'20.6"E.

A total of 45-day-old broiler chicks (Cobb strain) were brooded for 14 days. On the fifteenth day, the chicks were randomly divided into three rearing treatments: intensive, semi-intensive, and free-range. Each treatment group consisted of 15 broiler chickens, with three replicates per treatment and five chickens per replicate. Utilizing a Randomized Complete Block Design (RCBD), the animals were randomized into treatment groups.

Table 1. Description of the treatments used in the study

Treatment*	Housing System	Feeding Management
T1	Broiler chickens were kept in a cage system partly elevated from the ground	The broiler chickens under this system are fed commercial diets
T2	Chickens were housed during the night and in unfavorable weather conditions. Chickens also gain access to a range of a period	Semi-intensified raised are fed with formulated chicken ration following the suggestions provided by IIRR and NAPC, 2016
T3	Chickens gained free access to grassy areas for the whole day	Free-range chickens are fed with the same formulated chicken ration in Treatment 2, which is provided by the IIRR and NAPC, 2016

T1: Intensive; T2: Semi-intensive; T3: Free-range

The broiler chicken was placed in a different housing system (Table 1). The broiler raised under T1 (Intensive system) was placed in a cage made-up of coco lumber and bamboo for flooring with an area of $5ft^2$ per cage. Birds under T1 (Intensive system) received 12 hours of artificial lighting with the use of two L.E.D. bulbs in order to facilitate feeding at night. T2 Semi-intensive system housing comprised two divisions, the shed and the grazing or grassy area. The shed was made of nipa leaves for the roofing, lumber for foundations and bamboo for its sidings, having an area of $5ft^2$ with a deep litter composed of wood shavings. The birds under this treatment gained access to a grassy area from 7:00 am until 6:00 pm and were kept in the shed at night. The grassy area for T2, having an area of 10 ft^2, was fenced with black mesh nets on all sides, including the top portion of the area. Treatment 3 Free-range was fenced win a black net mesh attached to a bamboo strip that covers a 15 ft^2 of area. The birds under the free-range treatment were given total access to the outdoors. The treatment does not receive lighting at night and only with natural lighting during the day. The grazing area for both semi-intensive and free-range systems was composed mainly of Purple nutsedge (*Cyperus rotundus*), White kyllingia (*Kyllingia nemoralis*), Goose grass (*Eleusine indica*), and Barnyard grass (*Echinochloa crusgali*).

The birds under an intensive system were given a commercial grower (25-35 days) and finisher (36-42) days feed with the analysis shown in Table 2. On the other hand, semi-intensive and free-range broilers were given with formulated basal diet provided by IRR and NAPC 2016 (Table 3).

Table 2. Guaranteed analysis of commercial feed to broilers under intensive system

Analysis	Grower	Finisher
Crude protein, %	19.50	17.00
Crude fat, %	3.00	3.00
Crude fiber, %	6.00	8.00
Calcium, %	0.90-1.10	0.70-0.85
Phosphorous, %	0.55	0.55
Moisture, %	12.00	12.00

Individual measurements of each bird's body weight were taken before the study began. At the conclusion of the production period, the average gain per day was determined after calculating the ratio of feed conversion and the chickens' body weight gain on a weekly basis. By deducting the starting weight from the finished weight of a broiler chicken and using the following formula, the body weight increase for every chicken was determined:

$$\text{Body weight gain (BWG),g} = \text{Final weight (FW)} - \text{Initial Weight (IW)}$$

The average daily gain of the broiler chicken was calculated by subtracting the broiler chicken's initial weight from the animal's final weight in the harvesting period. It was divided by the total age of the animal.

$$\text{Average Daily Gain (ADG), g} = \frac{\text{Final weight (FW)-Initial weight (IW)}}{\text{Number of days}}$$

The feed conversion ratio (FCR) was calculated as the amount of feed given to the animal divided by its weight gained.

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Total amount of feed given}}{\text{Animal weight gain}}$$

Table 3. Composition and calculated nutrient analysis of basal diets fed to semi-intensive and free-range broilers

Composition	Parts, %
Yellow corn	40
Rice Bran D1	15
Copra meal	15
Fish meal	10
Ipil-ipil leaf meal	5
Mung bean	5
Egg shell	5
Salt	5
Total	100
Calculated Analysis	
Crude protein, %	19.18
Crude fat, %	5.02
Dry matter, %	86.99
Moisture, %	13.01
Ash, %	1.23

Source: Feed composition (IRRR and NAPC, 2016)

To determine the dressing percentage, the dressed broiler birds were weighed. The dressing percentage was determined by multiplying by 100 after splitting the warm carcass weight by the total live weight.

$$\text{Dressing Percentage (DP), \%} = \frac{\text{Warm carcass weight}}{\text{Live weight}} \times 100$$

The broiler breast meat samples were from the right pectoralis and were subjected to physical analysis after the post-slaughter period. The breast meat samples were subjected to pH value determination for 45 minutes post-mortem (Li *et al*., 2017) as the initial pH level and at 24 hrs. as the ultimate pH level. By removing the skin, the breast meat can be visible. The right breast meat portion was incised to determine the pH value, creating an opening gap between the muscles where the probe was inserted.

The method outlined by Wardlaw *et al.* was used to calculate the water-holding capacity (1973). A total of five grams of minced meat were weighed, and eight millilitres of a 0.6 ml NaCl solution were added to a 13-milliliter centrifuge tube. After centrifugation, the supernatant's volume was measured with a 10 ml volumetric graduated cylindrical container, and the findings were expressed as the fluid the sample had kept using the formula given below.

$$\text{Water Holding Capacity (WHC)} = \frac{(M1-M2)}{M1} \times 100$$

Where M1=Initial Volume before centrifugation and M2=volume of supernatant

AOAC (1995) standard methods were used to analyse the right breast's moisture, crude fat, crude protein, and ash content.

The data collected were analysed by Analysis of Variance of the Statistical Package for Social Sciences (SPSS software). Differences among group means were compared using Tukey's range test and were considered statistically significant ($p<0.05$). The pH level for 45 minutes and 24 hours were compared using paired samples T-test.

Results

The mean values of growth performance parameters, feed conversion ratio, body weight gain, and average daily gain were presented in Table 4. The mean values of weekly body weight were presented in Table 5, and the weekly feed conversion ratio was shown in Table 6.

Table 4. Mean values of growth performance of broiler chicken (*Gallus gallus domesticus* L.) raised under intensive, semi-intensive, and free-range raising systems

Treatments	ADG (g)	BWG (g)	FCR
Intensive	26.20 $\pm$3.28[a]	1100.33 $\pm$41.861[a]	2.90 $\pm$ 0.122[a]
Semi-intensive	23.02 $\pm$3.29[b]	967.00$\pm$38.314[b]	3.32$\pm$0.153[ab]
Free-range	21.07 $\pm$3.65[b]	926.33 $\pm$33.927[b]	3.49$\pm$0.354[b]
p-value[A]	0.001**	0.035*	0.053

T1=Intensive; T2=semi-intensive; T3=free-range

ADG=average daily gain; BWG=body weight gain; FCR=feed conversion ratio

[A]ANOVA=analysis of variance; >0.05=not significant, <0.05=significant*, <0.01=highly significant**

Table 5. Mean values of weekly body weight gain (g) of broiler chickens (*Gallus gallus domesticus* L.) raised under three different raising systems

Treatments	Week 1	Week 2	Week 3	Week 4
Intensive	306.00$\pm$14.03[a]	664.00$\pm$15.34[a]	925.33$\pm$13.25[a]	1100.33$\pm$13.77[a]
Semi-intensive	138.00$\pm$13.58[b]	399.33$\pm$18.21[b]	722.33$\pm$16.80[b]	967.00$\pm$13.81[b]
Free-range	153.67$\pm$18.87[b]	456.00$\pm$10.77[b]	738.67$\pm$19.98[b]	885.00$\pm$15.35[b]
p-value[A]	<0.001**	<0.001**	<0.001**	0.001**

T1=Intensive; T2=semi-intensive; T3=free-range

[A]ANOVA=analysis of variance; >0.05=not significant, <0.05=significant*, <0.01=highly significant**

The broilers raised under an intensive system showed the best daily gain performance among other treatment groups as shown in Table 4. However, the ADG in broilers in T2 (Semi-intensive) was lower than in T3 (free-range) broilers and had a minor daily gain performance. Moreover, results showed that there was a significant difference observed among treatments ($p<0.001$) but not on T2 (Semi-intensive) and T3 (free-range). The study revealed that the body weight gain in broilers (T1) intensive had the highest value among treatments, while those in T3 (free-range) had the lowest value of body weight gain. As shown in Table 4, a significant difference was observed between T1 (Intensive) and T3 (free-range). However, both treatments showed no significant difference over broilers raised in T2 (semi-intensive). On the other hand, the weekly performance of body weight gain in T1 (Intensive) broilers was superior to other treatment groups from the first week until the fourth week of the study (Table 5). During the first three weeks, broilers in T2 (semi-intensive) showed lower body weight gain compared to other treatments. However, during the fourth week, T3 (free-range) broilers' body weight gain was much lower than in T2 (semi-intensive). Moreover, the body weight gain in weekly performance showed highly significant differences every week in all treatments ($p<0.001$), which were observed from the intensive group.

The overall FCR of the broilers raised in three different raising systems was presented in Table 4. The feed conversion ratio of broilers under T1 (Intensive) was better than the FCR of broilers raised in T2 (semi-intensive) and T3 (free-range). It also indicated a lower feed conversion ratio in T3 (free-range). This result showed significant differences between T1 (intensive) and T3 (free-range) ($p<0.05$) but no significant difference in T2 (semi-intensive) ($p>0.05$). The weekly FCR performance of broilers raised under three different raising systems is shown in Table 6. T1 (intensive) broilers showed better FCR from week 1 until week 4 than other treatments. These results showed significant differences among treatments. On the other hand, results indicated that broilers in T2 (semi-intensive) and T3 (free-range) also performed well throughout the study. However, T2 (semi-intensive) showed no significant differences ($p>0.05$) between T3 (free-range) from week 1 until week 4.

Table 6. Mean values of weekly feed conversion ratio of broilers (*Gallus gallus domesticus* L.) raised under three different raising systems

Treatments	Week 1	Week 2	Week 3	Week 4
Intensive	$1.76 \pm .80^{a}$	$1.85 \pm .32^{a}$	$2.51 \pm .37^{a}$	$2.90 \pm .38^{a}$
Semi-intensive	$2.64 \pm .22^{b}$	$2.45 \pm .65^{b}$	$3.15 \pm .48^{b}$	$3.31 \pm .49^{b}$
Free-range	$3.16 \pm .17^{b}$	$2.76 \pm .62^{b}$	$2.88 \pm .44^{b}$	$3.49 \pm .40^{b}$
p-value^{A}	0.004*	<0.001**	.001**	0.007**

T1=Intensive; T2=semi-intensive; T3=free-range
^{A}ANOVA=analysis of variance; >0.05=not significant, <0.05=significant*, <0.01=highly significant**

The mean dressing percentage of broilers raised in three different raising systems was presented in Table 7. Broilers raised in T1 (intensive) demonstrated the highest dressing percentage over the other treatment groups. Broilers in T2 (semi-intensive) attained a higher dressing percentage than T3 (free-range), which had the lowest dressing percentage and showed no significant difference between all experimental groups.

Result showed the average pH and water-holding capacity of right breast flesh from broilers raised in three distinct raising methods (Tables 8 and 9). The results indicated that the right breast under T1 (intensive) had the highest pH level compared to other treatments. However, the right breast meat in T3 (free-range) had the lowest pH level. Moreover, a highly significant difference was observed between 45 minutes and 34 hours of broiler meat ($p<0.01$). On the other hand, T1 (intensive) obtained the highest capacity than other treatments. The right breast meat in T3 (free-range) had the lowest WHC among other treatments, while T1 (intensive) had the highest WHC value. This showed no significant differences between treatment groups regarding broiler breast water holding capacity ($p>0.05$).

Table 7. Mean value of dressing percentage of broiler (*Gallus gallus domesticus* L.) raised in intensive, semi-intensive, and free-range raising system

Treatments	DP,%
Intensive	71.08±4.56
Semi-Intensive	68.92±2.95
Free-range	67.14±5.47
p-value[A]	0.064

DP=dressing percentage; T1=Intensive; T2=semi-intensive; T3=free-range

[A]ANOVA=analysis of variance; >0.05=not significant, <0.05=significant*, <0.01=highly significant**

Table 8. Mean values of pH level of breast meat of broilers raised in three different raising systems

Treatments	pH (45 minutes)	pH (24 hours)	p-value[B]
Intensive	5.95±.19	5.29±0.19	<0.001**
Semi-intensive	5.85±.18	5.23±0.13	<0.001**
Free-range	5.80±.22	5.21±.16	<0.001**
p-value[A]	0.11	0.479	

[A]ANOVA; [B]Paired samples T-test.

The moisture content of broiler breasts was presented in Table 10. Results indicated that breast meat in T2 (semi-intensive) had the highest moisture content compared to other treatments. Moreover, broiler breast meat in T1 (intensive) showed the lowest moisture content among treatment groups. Results also showed no significant difference between treatments in terms of moisture content in broiler breast meat ($p>0.05$). The broiler breast meat in T3 (Free-range) had the highest ash content among treatments. This was followed by breast meat in T1 (intensive) and T2 (semi-intensive), which had the lowest value of ash content among treatment groups. However, this showed that there was no significant difference between treatments in terms of ash content. The mean values of the protein content of broiler breast meat were shown in Table 10. Meat in T3 (free-range) had the highest protein value than T2 (semi-intensive). Nevertheless, T1 (intensive) had the lowest significant difference between treatments in terms of protein content. As presented in Table 10, meat in T1 (intensive) attained the highest value of fat content, which was followed by T2 (semi-intensive) and T3 (free-range), which had the lowest fat content percentage among treatment groups. Moreover, it showed that there was no significant difference observed between the treatment groups in terms of broiler breast fat content.

Table 9. Mean values of water-holding capacity of breast meat of broilers raised in three different raising systems

Treatments	WHC (%)
Intensive	60.42±.69
Semi-intensive	60.75± .14
Free-range	50.67±.23
p-value[A]	0.274

WHC=water-holding capacity; [A]ANOVA=analysis of variance; >0.05=not significant, <0.05=significant*, <0.01=highly significant**

Table 10. Mean values of breast meat proximate composition from broilers raised under three different raising systems

Treatments	MC (%)	Ash (%)	Protein (%)	Fat (%)
Intensive	74.37±1.24	1.49±.28	22.98±.38	3.76±.97
Semi-intensive	75.78±.39	1.42±.03	23.25±.06	3.33±.87
Free-range	75.78±.49	2.17±.68	23.85±.58	3.18±.76
p-value[A]	.119	.131	.088	.71

MC=moisture content; [A]ANOVA=analysis of variance; >0.05=not significant, <0.05=significant*, <0.01=highly significant**

Discussion

The success of broiler chickens' growth is impacted by their raising method. Broilers raised under an intensive system have superior average daily gains, body weight gains, and feed conversion ratios than broilers raised according to semi-intensive and free-range conditions. It was anticipated that hens within the intensified setup would perform better as they moved less, which helped them use their feed more effectively (Wang *et al.,* 2015). At the same time, semi-intensified and free-range raised broilers were more likely to forage and venture into outdoor conditions. According to Pavlovski *et al.,* (2009), who stated that chickens raised under intensive system attained considerably more weight when than chickens raised semi-intensively, the lower body gain in weight achieved by broilers using the semi-intensive system could have been due to their increased activity, that consequently led to a rise in energy the need and reduction in energy utilization for the production of meat.

Furthermore, free-range broilers had lower daily body weight than intensively bred chickens because they were subjected to temperature changes and engaged in more outdoor activity, which increased their energy needs. (Li e*t al.,* 2017). Lowering body weight in broilers in both extensive access systems may be associated with foraging, particularly during grass consumption, which cannot be digested due to high cellulose content and complex carbohydrates. Also, grasses had low crude protein and energy content (Sloan and Damron, 2003).

The dressing percentage is a significant factor affecting the value of the slaughtered animal. The broilers raised under an intensive system tend to have the highest dressing percentage, possibly due to limited movement with less energy exerted and improved conversion of feed into muscle. The lower dressing percentage of both semi-intensive and free-range broilers may be due to the diet's alteration, which directly affects the dressing percentage (Cerrate *et al.,* 2006) since broilers under these two systems are exposed to the consumption of grass aside from formulated feeds. Moreover, the variations in the dressing percentage of broilers in the three raising systems are associated with the trends of the body weights of experimental birds as it shows that the increase or decrease of the dressing percentage is directly upon the body weight of birds. The broilers' dressing percentage may also associate with the available diet given and consumed. According to Payne and Wilson (1999), the kind of diet available affects the dressing percentage, particularly with a diet having a high proportion of concentrates which contributes to improving the utilization of nutrients and to the formation of more muscle. It can also be affected when a high percentage of forage having low digestibility contributes to a low dressing percentage (Rahman and Aksoy, 2014).

According to Kauffman (2001), broiler breast meat contains roughly 72–75% moisture, with semi-intensive and free-range systems having greater moisture content percentages. According to Pearson and Young (1989), meat's moisture content has an inverse connection with muscle fat content, meaning meat with less fat will have more moisture. However, meat from animals raised widely had more moisture than meat from animals raised intensively. (Summers *et al.,* 1978). This is in line with intensive systems yielding carcasses with more fat than animals that are raised for a long time. (Diaz *et al.,* 2002).

When compared to broilers raised intensively, the breast meat of free-range and semi-intensive birds had the greatest ash content. This might be because during range, tiny amounts of the ground's mineral-rich soil are consumed and digested. (Olsson and Pickova, 2005). The elevated ash concentration found in animals outside may also be related to an increase in muscle pigmentation brought on by anaerobic activity (Hanekom, 2010).

The chicken meat samples from semi-intensive and free-range broilers possess the highest protein contents, despite the fact that the chicken breast meat in this research has a high protein content. In accordance with Castellini *et al.* (2002), chickens raised with access to the outdoors have meat that is higher in protein than fat. This is because chickens with access to the outdoors have increased motor activity, which reduces the amount of fat in their muscles. Furthermore, it was suggested by Diaz *et al.* (2002) that high levels of production change an animal's metabolism by consuming triglycerides normally used to build muscle. Another element is the broiler's diet, which is among the most significant outside variables that can impact the meat's protein content in broiler-raising systems (Mir *et al.,* 2017; Ebegbulem *et al.,* 2023). The study's semi-intensive and free-range broilers also depended on grasses and organisms that could influence the meat's protein content if they were present on the range.

Furthermore, compared to broilers grown semi-intensively and free-range, the breast meat to broilers produced intensively contained more fat. The higher energy diets and low levels of physical exercise that result in the generation of carcasses with noticeably thicker subcutaneous fat layers may be the cause of the rise in fat in intensive broilers (Diaz *et al.,* 2002). However, access to the environment consumes more energy, favoring myogenesis over lipogenesis, and boosts motor activity, which causes fat to accumulate in the muscles. This may explain why the fat content in broiler breasts in both treatments with outdoor access is lower (Castellini *et al.*, 2002). However, the research showed that raising systems have no impact on the amount of fat of breast muscle.

Due to its impact on the meat's texture, juiciness, cooking loss, microbiological stability, color, and, most importantly, the meat's ability to hold water, the pH decline under post-mortem circumstances is one of the most important variables in the process of transformation of muscle to meat. The amount of pH reduction in meat is influenced by the glycolysis process (den Hertog-Meischke *et al.,* 1997). After the animal is killed, the oxygen supply stops, but the anaerobic transformation of glycogen into lactic acids continues to be used for ATP synthesis, which causes the decline after a time of chilling. As reported by Wang *et al.* (2009) as well as Fanatico *et al.* (2007), who predominantly claimed that the pH level is reliant primarily in the quantity of glycogen that exists in meat, the pH concentration in broiler meat was also found in the study to be unaffected by the raising methods. The recent study discovered that broiler chickens raised in intensive and free-range groups, which allowed them access to the outdoors, both had a minor pH level of meat. According to Castellini *et al.* (2002), chickens that have access to the outdoors have lower pH levels than intensely raised broilers because birds raised in intensified conditions tend to have less movement and consumption of glycogen reserved prior to slaughtering the animal. Also, a possible reason for having low pH of broilers having access to the outdoors is caused by increased activities and of birds which results in type 2A of muscle known to have high glycogen content, which has high anaerobic glycolysis that results in a low pH during post mortem (Smith and Northcutt, 2009). On the other hand, the water-holding capacity of the breast in both semi-intensive and free-range broiler breast meat is lower. This result also coincides with the reports of Pavlovski *et al.* (2009) that semi-intensified and free-range broilers had lower water holding capacity.

In conclusion, broiler chickens should be reared in an intensive management system for better growth performance and dressing yield. Moreover, despite the minor growth performance and dressing percentages, broilers raised in semi-intensive and free-range tended to improve the quality of meat, particularly the chemical composition. It can be suggested that adopting a semi-intensive or free-range system may be beneficial for enhancing the nutritional profile of broiler meat, providing a healthier alternative for consumers.

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