e-ISSN 2795-3276
p-ISSN 2795-3270

GPH INTERNATIONAL JOURNAL
Research in
Biological Science
www.gphjournal.org || editor@gphjournal.org

10.5281/zenodo.8167882 Vol. 06 Issue 06 June - 2023 Manuscript ID: #0942

EFFECT OF NON-USE OF ANTIBIOTICS ON THE ZOOTECHNICAL PERFORMANCE OF COBB 500 BROILER CHICKENS AT THE DIALLO FARM IN THE COMMUNE OF KORHOGO, NORTHERN CÔTE D'IVOIRE

Gatien Konan Gboko Brou, Ivoirien, Enseignant-Chercheur, Maître-Assistant, Laboratoire de Biologie, de Production et de Santé Animale, Institut de Gestion Agropastorale (IGA), Université Peleforo Gon Coulibaly (UPGC) de Korhogo.

Benjamin Kiffopan M'Bari, Ivoirien, Chercheur, Chargé de recherche, Laboratoire de Biologie, de Production et de Santé Animale, Institut de Gestion Agropastorale (IGA), Université Peleforo Gon Coulibaly (UPGC) de Korhogo.

Fatoumata Coulibaly, Ivoirienne, Chercheure, Chargée de recherche, Laboratoire de Biologie, de Production et de Santé Animale, Institut de Gestion Agropastorale (IGA), Université Peleforo Gon Coulibaly (UPGC) de Korhogo.

Nicolas Bosson Aboly, Ivoirien, Enseignant-Chercheur, Maître-Assistant, Laboratoire de Biologie, de Production et de Santé Animale, Institut de Gestion Agropastorale (IGA), Université Peleforo Gon Coulibaly (UPGC) de Korhogo.

Sogodogo Djénebou, Ivoirienne, Master 2, Ingénierie Zootechnique, Laboratoire de Biologie, de Production et de Santé Animale, Institut de Gestion Agropastorale (IGA), Université Peleforo Gon Coulibaly (UPGC) de Korhogo.

René Soro Yadé, Enseignant-Chercheur, Maître de Conférences, Laboratoire de Biochimie, microbiologie et des substances naturelles, Université Nangui Abrogoua.

Corresponding author gatienbrou@gmail.com

ABSTRACT

This study was conducted at the Diallo farm in the commune of Korhogo, precisely in the new district. The general objective of this study was to evaluate the effect of not using antibiotics on the zootechnical performance of Cobb 500 broiler chickens. The experimental device consisted of constituting 2 batches of 50 broiler chickens. Batch 1, which is the control batch, did not receive antibiotics after the start until the end of the experiment. Batch 2 received antibiotics for six (6) weeks. The results showed that the broilers of batch 1 obtained the best zootechnical performance. After 42 days of breeding, the chickens of this batch consumed 6300 ml of water and 3150 g of food per bird. They obtained an average weight of 2230g against 1950g for batch 2. Similarly, they obtained a low mortality rate (8%) and a better carcass yield (75.33%). Ultimately, breeders would benefit from avoiding antibiotics for better zootechnical performance in broilers and to preserve human health.

KEYWORDS: Broilers, antibiotics, zootechnical performance, Korhogo.

INTRODUCTION

In Ivory Coast, the agricultural sector represents 22% of the Gross Domestic Product (GDP) and employs two-thirds of the active population. It contributes 34% to the total GDP and 66% to export revenues. The inclusion of livestock as a development sector has highlighted many regions in the north where livestock is the main activity, a source of income and well-being (**FAO, 2023**). Particularly in poultry farming, various development policies since independence have contributed to the creation of a modern industry with over 10,000 jobs. This development has led to a 37% increase in poultry meat production and an estimated turnover of 34 billion CFA francs (**IPRAVI, 2009**).

Despite the recorded achievements, the State of Ivory Coast has allowed imports of poultry meat solely to compensate for the deficit in relation to national needs. Unfortunately, far from being an ideal solution, meat imports, especially when they are extra-West African, coupled with the wave of globalization, hinder the development momentum (**M'bari, 2000**). However, health problems related to the poultry sector have now become an international scourge. Modernization has been carried out at the expense of hygiene standards, leading to the development of various pathologies in these farms, often with disastrous consequences for poultry and even for humans (**Guerin, 2015**).

The emergence of these pathologies has resulted in the massive use of antibiotics in poultry (**Robineau and Maolic, 2010**). However, the improper use of antibiotics in preventive or curative treatment in livestock has led to the selection of resistant bacterial strains (**Bonnet et al., 2009**). In the commune of Korhogo, antibiotics are used in broiler farms. The problem is to determine whether the absence of antibiotics in the treatment of broiler chickens ensures their proper growth. It is in this context that this study aims to evaluate the growth of broiler chickens exempt from antibiotics.

MATERIALS AND METHODS

Presentation of the study area

Korhogo is the third most populous city in Côte d'Ivoire, located in the north, 648 km away from Abidjan, the economic capital. It is the capital of the Savanes District and the Poro Region. Korhogo is both a municipality and the administrative center of a sub-prefecture and department. The Department of Korhogo shares borders with the departments of M'Bengué and Tengrela to the north, Dikodougou and Mankono to the south, Sinematiali to the east, and Boundiali to the west (**INS, 2021**). Figure 1 shows the layout of the municipality of Korhogo.

Experimental setup

The experiment was conducted in a building measuring 11 meters in length and 7 meters in width, resulting in a total area of 77 square meters. Inside this building, two compartments of 5 square meters each were defined. Each compartment received 50 chicks after heating. The stocking density was 10 chickens per square meter. A total of 100 broiler chickens were used. Lot 1 (control group) did not receive any antibiotics from the start until the end of the trial. As for Lot 2, it continued to receive antibiotics throughout the 45-day rearing period. The building used for the experiment underwent sanitary prophylaxis before the start of the trial. Cresyl, bleach, and Omo soap were used to clean and disinfect the facilities. The litter used consisted of rice straw. It was treated with copper sulfate one day before the chicks were placed, using a spraying method. The rearing equipment is cleaned daily before the distribution of feed and water. The feed is provided to the chickens twice a day, in the morning at 8:00 AM and in the afternoon at 4:30 PM. Weighings are conducted each week at a consistent time between 4:00 PM and 4:30 PM. A 10% sample is weighed. The medical prophylaxis applied is outlined in Table I. The trial started on February 6 and concluded on March 27, 2023.

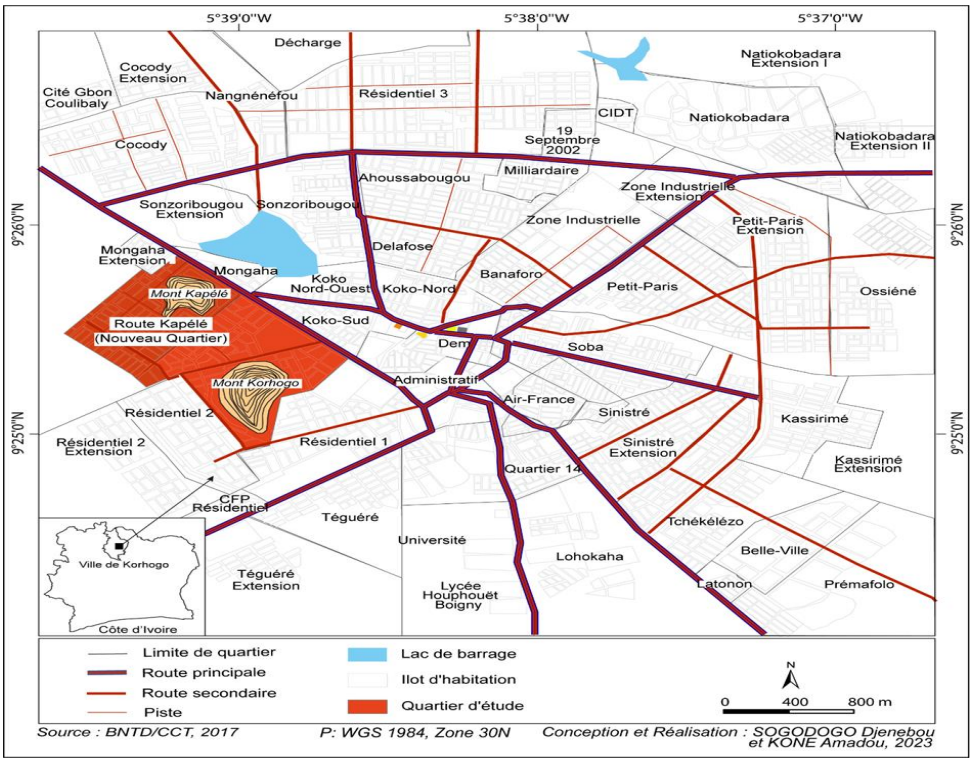

***Figure 1*:** Map of Korhogo commune (Sogodogo and Koné, 2023)

Table I: Medical prophylaxis used

Batch 1	**Batch 2**
D1 Sugar water (0,5g/l)	Sugar water (0,5g/l)
D2 vaccine HB1+H120	vaccine HB1+H120
D3-D6 Panteryl (1cc/10L)	Panteryl (1cc/10L)
D7 vaccine (HIPRAGUMBORO)	vaccine (HIPRAGUMBORO)
D8-D10 Amin total (1cc/10L)	Amin total (1cc/10L)
D11-13 Eau simple Panteryl (1cc/10L)	
D14 Recall (HIPRAGUMBORO)	Recall (HIPRAGUMBORO)
D15-20 Simple water	Simple water
D21 Vetacox (1cc/10L)	Vetacox (1cc/1OL)
D22-27 Simple water	Simple water
D28-30 Simple water	Simple water
D31-35 Amin total (1cc/10L)	Amin total (1cc/10L)
D36-38 Simple water	Panteryl (1cc/10L)
D39-42 Simple water	Simple water

Calculation of zootechnical parameters studied

Feed consumption (FC)

Each morning and evening, the amount of food to be distributed that day was also weighed. The daily food consumption per subject was determined by dividing the quantity of food distributed per batch by the number of chickens present. It is expressed in grams (g), and its formula is as follows:

$$\mathbf{FC} = \frac{\text{Amount of feed distributed} - \text{Amount of feed remaining}}{\text{Number of chickens present}}$$

Water consumption (WC)

The daily water consumption is obtained by taking the difference between the quantity of water distributed and the quantity of water remaining divided by the number of chickens present. The consumption was measured every morning and evening. It is expressed in milliliters (ml), and its formula is:

$$\mathbf{WC} = \frac{\text{Amount of water dispensed} - \text{Amount of water remaining}}{\text{Number of chickens}}$$

Average weight (AW)

The average live weight is calculated after each weighing. It allows us to assess the evolution of the subjects' weight. The choice of subjects to be weighed is random without any morphological distinction. The Average Weight is determined by dividing the sum of the weights of the weighed subjects by the number of chickens weighed. It is expressed in grams (g), and its formula is:

$$\mathbf{AW} = \frac{\text{Sum of the weights of the subjects weighed}}{\text{Number of chickens weighed}}$$

Average daily gain (ADG)

The Average Daily Gain is calculated by dividing the average weight gain during a period over the number of days. It is expressed in grams per day (g/d) and its formula is as follows:

$$\mathbf{ADG} = \frac{\text{Average weight for a period}}{\text{Number of days}}$$

Consumption index (CI)

The Consumption Index is the quantity of food consumed by an animal to increase its weight by one kilogram. It was determined by dividing the amount of food consumed during a given period by the average weight during this same period. Its formula is:

$$\mathbf{CI} = \frac{\text{Amount of food consumed during a period}}{\text{Average weight gain during the same period}}$$

Consumption index (CI)

The Consumption Index is the quantity of food consumed by an animal to increase its weight by one kilogram. It was determined by dividing the amount of food consumed during a given period by the average weight during this same period. Its formula is:

$$\mathbf{CI} = \frac{\text{Amount of food consumed during a period}}{\text{Average weight gain during the same period}}$$

Mortality rate (TM)

The mortality rate (TM) corresponds to the ratio of the total number of dead subjects to the initial number of subjects during a study period, multiplied by 100. It is expressed as a percentage (%) and its formula is as follows:

$$\mathbf{TM} = \frac{\text{Number of subjects who died during the period}}{\text{Total number of subjects during the period}} \text{ X } 100$$

Carcass yield

Carcass yield (CR) is calculated from live weight data at slaughter and carcass weight. It is expressed as a percentage (%) and has the formula:

$$\mathbf{CR} = \frac{\text{Carcass weight}}{\text{live weight}} \text{ X } 100$$

Data processing

Field data was entered and processed using a computer tool. The data collected on the zootechnical variable differences were recorded with Microsoft Excel version 2016 software. These data were then subjected to a descriptive analysis with the same software.

RESULTS

Feed and water consumption

The daily feed consumption of the broiler chickens of batch 1 (control) is higher than that of batch 2 over the entire test period. The feed consumption of the chickens of batch 1 increased from 30 g/d to 115 g/d from the first week to the sixth week while that of the subjects of batch 2 increased from 30 g/d to 110 g/d . At the end of the 6 weeks of the experiment, the cumulative feed consumption of the chickens of batch 1 is 3150 g/subjects against 2975 g/subjects for batch 2 (figure 2). The chickens of batch 1 having received only the simple water consumed more water than batch 2. The daily water consumption of the chickens of batch 1 increased from 55 ml/d to 260 ml/d from the 1st week to the 6th week while that of batch 2 increased from 55 ml/d to 230 ml/d. Obviously, the cumulative water consumption of broilers in lot 1 was higher than that of lot 2. After 45 days of rearing, the cumulative

water consumption of broilers in lot 1 was 6300 ml/subjects versus 5565 ml/subjects for batch 2 (Figure 3).

Average weight

The evolution of the average weight of the two batches of broilers is presented in Figure 4. From the first week to the third week, the curves of evolution of the two batches of chickens are practically identical. From the third week, the chickens of batch 1 (control) having consumed simple water obtained the best results. From 42g on the first day, they obtained an average weight of 2230 g or 2.23 kg after 6 weeks while those of batch 2 who received the treatment recorded 1950 g or 1.95 kg.

Average daily gain

Table II presents the evolution of the average daily gain of the broilers of the two batches (batch 1 and batch 2). The batch 1 broilers obtained the best grains of weight compared to batch 2. From the first to the sixth week, the ADGs of the two (2) batches of chickens increased gradually. It went from 14±0.53g/d to 111.42±1.3g/d for batch 1 against 14±0.43 to 96.42±1.1g/d for batch 2. After 6 weeks of breeding, the ADG of the chickens of batch 1 was 111.42 ± 1.3 g/d against 96.42 ± 1.1 g/d respectively for batch 2.

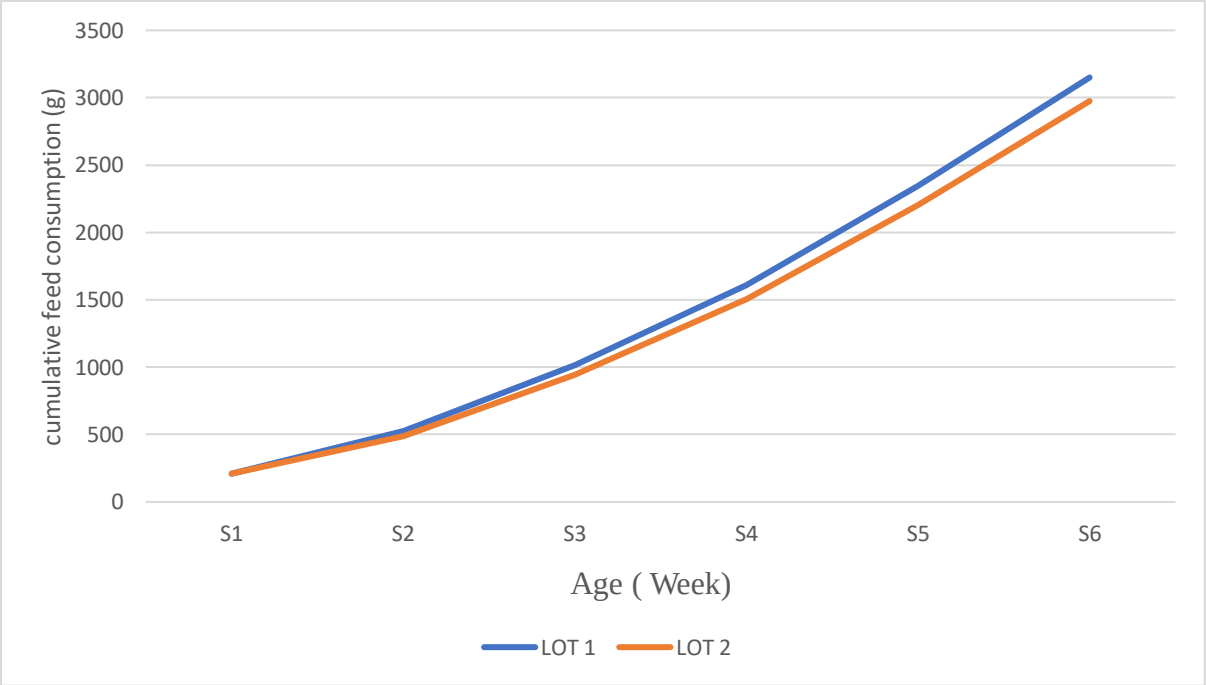

***Figure 2*:** Evolution of cumulative feed consumption per week

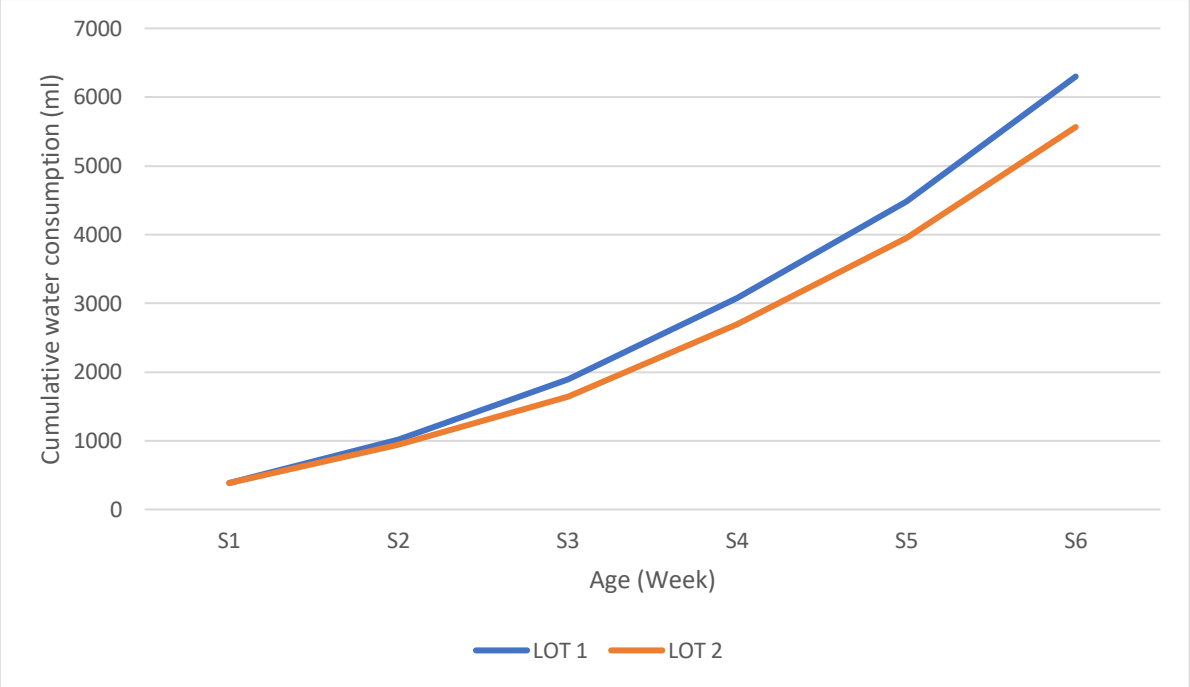

Figure 3: Evolution of cumulative water consumption per week

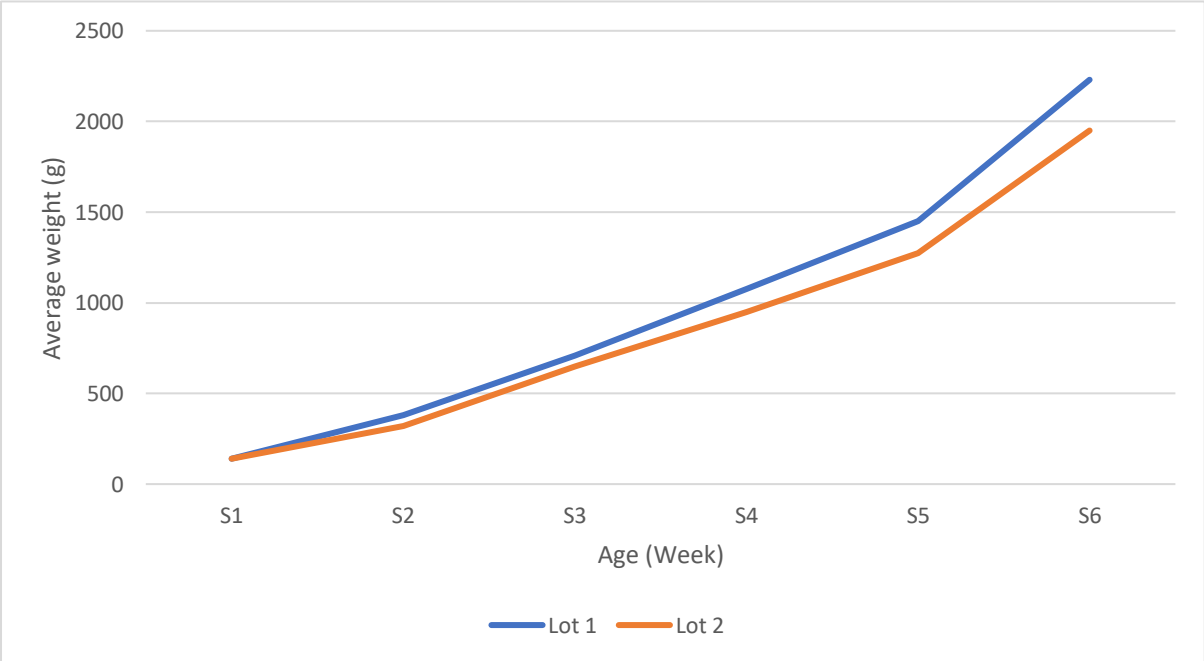

***Figure 4*:** Variation in average weight per week and per batch

***Table II*:** Evolution of the average daily gain (ADG g/d) of the different batches

Age (Week)	**ADG (g/d)**	
	Lot 1	**Lot 2**
W1	14±0,53	14±0,43
W2	34±1,3	25,71±1,05
W3	47,14±3,26	47,14±4,5
W4	52,14±5	42,85±3,2
W5	53,57±2,57	46,42±2,65
W6	111,42±1,3	96,42±1,1

Consumption index

The chickens of batch 2 obtained the best consumption indices over the entire period of the experiment (Figure 5). The CIs of the two batches (1 and 2) are identical to the first week with a value of 1.12. From the first to the sixth week, we observe a gradual increase in the ICs of lot 1. It went from 1.12 to 1.71. From week one to week two, Lot 2 sees a gradual increase in value from 1.12 to 1.81. At the third week, the IC of lot 2 decreases having a value of 1.45. From the fourth to the sixth week, we observe a progressive increase in the ICs of lot 2, going from 1.58 to 1.181. After 45 days, the highest CIs were noted in the chickens of batch 2 while the lowest are those of batch 1 (control).

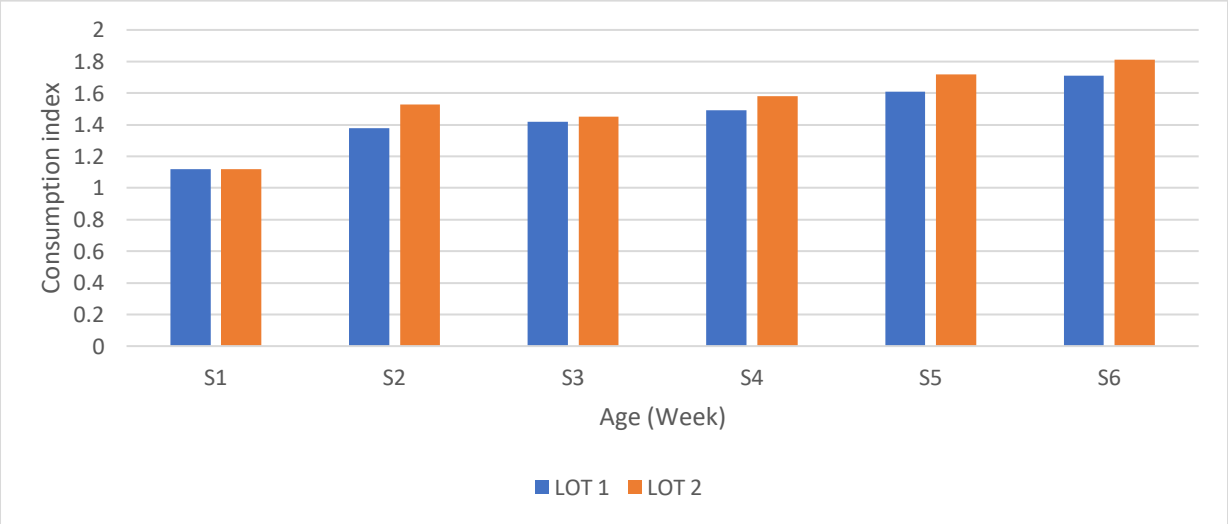

Figure 5: Evolution of the consumption index per week and per batch

Mortality rate and carcass yield

The mortality rate of these two batches is shown in Figure 6. The mortality rate of batch 2 is higher than that of the batch. At the end of these 45 days of testing, a mortality rate of 8% or 4 deaths was recorded in batch 1 against 14% or 7 deaths for batch 2. The highest mortality rate was noted at the first week in these different batches. However, no mortality was listed at the 3rd, 4th and 6th weeks in these two batches. Figure 7 shows that the best carcass yield was obtained in batch 1 chickens. carcass 1680g, the broilers of batch 1 obtained a carcass yield of 75.33%. Those of batch 2 obtained 70.25% with a live weight of 1950g and a carcass weight worth 1370g.

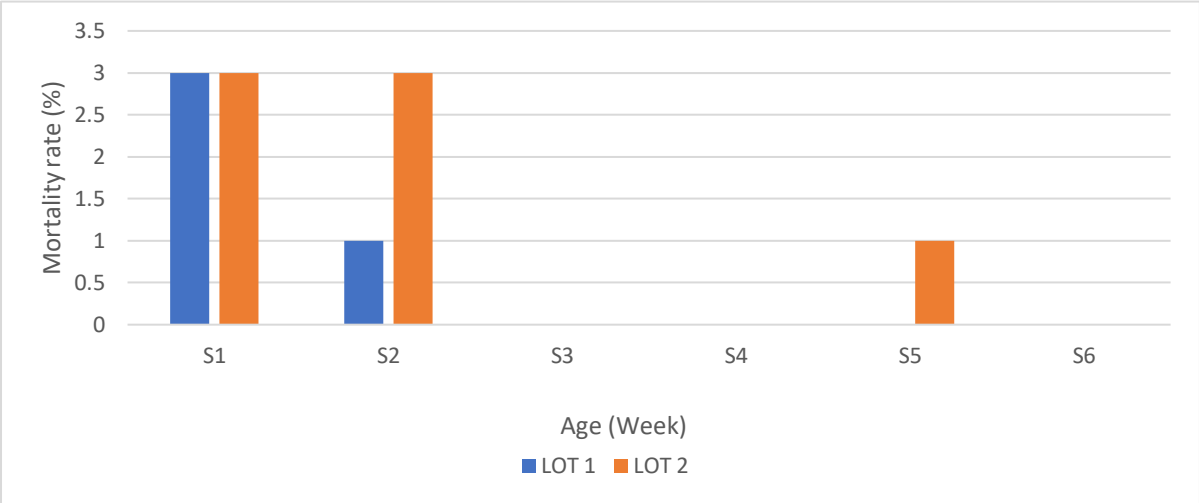

Figure 6: Evolution of the mortality rate of the two (2) batches

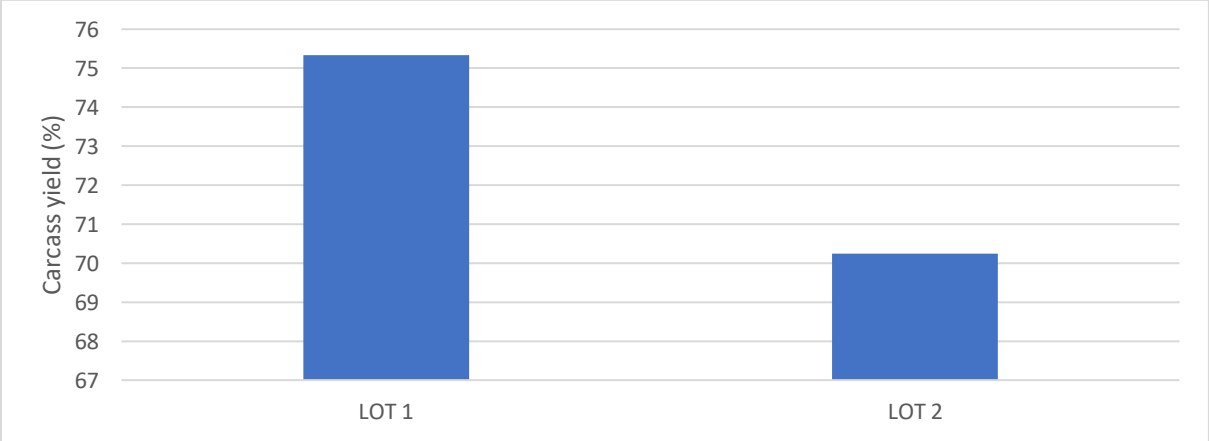

***Figure 7*:** Carcass yield of the different batches

DISCUSSION

The cumulative feed consumption of the chickens in lot 1 at the end of the trial was 3150 g/subject, which is higher than that of lot 2, which was 2975 g/subject. Similarly, in terms of water consumption, the subjects in lot 1 consumed 6300 ml/subject, which is higher than the 5565 ml/subject consumed by lot 2. This situation could be explained by the presence of antibiotics in the drinking water. Indeed, some antibiotics have a taste that decreases the appetite of broiler chickens towards water. Additionally, certain antibiotics give certain coloration to the water, which could arouse suspicion in broiler chickens. According to Brou et al. (2018), broiler chickens consume 2 to 3 times more water than feed. The result obtained for feed consumption in lot 1 is higher than that of Coulibaly (2022), who obtained 2990 g/subject in their study on broiler chickens at the Karakoro Jubilee Center farm.

The growth of broiler chickens in lot 1 was faster than that of lot 2. In lot 1, the average live weight of a subject was 2230 g compared to 1950 g in lot 2. This situation could be explained by the improper use of antibiotics. Indeed, the prescribed doses are not always respected. Several authors such as Soltz (2008) and Sanni (2014) agree and emphasize the improper use of antibiotics in livestock farming in general and particularly in broiler chickens. They do not consult specialists for the choice of products and doses. Bouras and Ben (2020) state that some breeders economize on products or overdose. The average weight of the subjects in lot 1, which is 2230 g, is almost identical to that of Ouattara (2022), who obtained a live weight of 2250 g in broiler chickens during their study at the Diallo farm. In their case, the drinking water of the broiler chickens contained ice.

The mortality rates recorded during this study were 8% and 14% in lots 1 and 2, respectively. The high mortality rate observed in lot 2 could be explained by the excessive use of antibiotics. In this context, Sander et al. (2011) affirm that the abusive use of antibiotics and the non-compliance with usage standards can lead to antimicrobial resistance, toxicological problems, and even death in some cases. Regarding carcass yields, the chickens that consumed plain water obtained the best result. Their carcass yield is 75.33% compared to 70.25% for lot 2. This situation could be explained by the rapid fattening of the subjects in lot 1. This result is higher than that of Kana et al. (2015), who, after substituting corn with sweet potato at varying rates from 0 to 100%, found carcass yields ranging from 68.11% to 73.13%.

CONCLUSION

At the end of this study, it is clear that the use of antibiotic-free water for watering improves the average weight of broilers. The best results were obtained by the chickens of batch 1 (control). During the six (6) weeks of the experiment, they consumed 3150 g of food and 6300 ml of water on average per subject. They recorded an average weight of 2230g with a feed conversion of 1.71 and a mortality rate of 8%. On the other hand, the chickens of batch 2 consumed 2975g of food and 5565ml of water and obtained an average weight of 1950g, a consumption index of 1.81 with a mortality rate of 14%. Additional studies could be conducted to assess the effect of antibiotic-free water consumption on the organoleptic and biochemical quality of broiler meat.

BIBLIOGRAPHIC REFERENCES

Bonnet, C., Diarrassouba, F., Brousseau, R., Masson, L., Topp, E., & Diarra, M. S. (2009). Pathotype and antibiotic resistance gene distribution of Escherichia coli isolates from broiler chickens raised on antimicrobial supplemented diets. Applied and Environmental Microbiology, 75(22), 6955-6962.

Bouras, C., & Ben S.K. (2020). Essai de formulation d'un aliment de poulet de chair en incorporant les ressources locales. Mémoire de Master en production et nutrition animale. Département des sciences agronomiques, Université Mohamed Boudiaf (Algérie), 78 pages.

Brou, G. K. G., Diaby, M., Silué, N., & Soro, Y. R. (2018). Etat des lieux des mesures de prophylaxie sanitaire dans les élevages de poulets de chair, souche COBB 500, dans le département de Korhogo (Cote d'Ivoire). Journal of Applied Bioscience, 126(2), 12717-12723.

Coulibaly, A. (2022). Effet de l'enrichissement du maïs par la patate douce bouillie sur quelques performances zootechniques des poulets de chair dans la sous-préfecture de Korhogo. Mémoire de master en ingénierie zootechnique, Institut de Gestion Agropastorale (IGA), Université Pelefolo GON Coulibaly de Korhogo (Cote d'Ivoire), 46 pages.

Food and Agriculture Organization (FAO). (2023). Passerelle sur l'aviculture et les produits avicoles, 4p.

Guerin, J. L. (2015). L'élevage de poulet standard. Ecole Vétérinaire de Toulouse (France), Rapport de stage de fin de formation, 15p.

INS. (2021). Recensement General de la Population et de l'Habitat. Direction Régionale du District des Savanes, 50p.

IPRAVI. (2009). La filière avicole ivoirienne. Journée technique avicole-Dakar. [Online]. Available at: http://fr.scribd.com/doc/54610596/Presentation de-La-Filiere-Avicole-de-La-Cote-d-Ivoire-IPRAVI (Accessed: December 20, 2013).

Kana, J. R., Doue, M., Kreman, K., Diarra, M., Mube, K. H., Ngouana, T., & Teguia, A. (2015). Effet du taux d'incorporation de la farine de patate douce crue dans l'aliment sur les performances de croissances du poulet de chair. Journal of Applied Biosciences, 91, 8539-8546.

M'bari, K. B. (2000). Contribution à l'identification des contraintes au développement de l'aviculture moderne en Côte d'Ivoire. Thèse de doctorat en médecine vétérinaire, Ecole Inter-Etats des Sciences et Médecine Vétérinaire, Université Cheick Anta Diop de Dakar (Dakar, Sénégal), 114 pages.

Quattara, L. (2022). Effet de la consommation d'eau fraiche en saison sèche sur les performances zootechniques des poulets de chair à la ferme Diallo dans la commune de Korhogo. Mémoire de master en ingénierie zootechnique, Institut de Gestion Agropastorale (IGA), Université Pelefolo GON Coulibaly de Korhogo (Cote d'Ivoire), 38 pages.

Robineau, B., & Moalic, P. Y. (2010). Une maladie d'actualité en production aviaire: la colibacillose. Bulletin Académique Vétérinaire France, 163(3), 983-990.

Sanders, P., Bousquet-Melou, A., Chauvin, C., & Toutain, P. L. (2011). Utilisation des antibiotiques en élevage et enjeux de santé publique. INRAE Production Animale, 24(2), 199-204.

Sanni, J. Y. (2014). Effets d'une litière à base d'attapulgite calcinée, sur les performances de croissance du poulet de chair. Thèse de doctorat en médicine vétérinaire, (EISMY/UCADD), (Dakar, Sénégal), 88 pages.

Sogodogo, D., & Koné, A. (2023). La carte de la commune de Korhogo, 1p.

Stoltz, R. (2008). Les résidus d'antibiotiques dans les denrées d'origine animale: évaluation et maîtrise de ce danger. Thèse de doctorat en médecine vétérinaire. Université Claude Bernard-Lyon I, (Lyon, France), 152 pages.