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Evaluation of performance in broilers kept on prophylactic medication with coccidiostats

TURKSON (P.K.), OSAFO-ADU (A.). Estimation des performances des poulets de chair maintenus sous traitement prophylactique anticoccidien. *Revue Elev. Méd. vét. Pays trop.*, 1991, 44 (4) : 491-496

La coccidiose aviaire se caractérise par une perte de poids et une détérioration de l'efficacité alimentaire. Pour compenser les pertes dues à cette affection, la chimiothérapie a été recommandée. Les coccidiostatiques à base d'amprolium ont été employés pendant longtemps au Ghana. Récemment, a été introduit un mélange composé de triméthoprime et de sulphaquinoxaline, considéré comme un substitut à l'amprolium en raison des risques de chimiorésistance à ce dernier. Une étude a été conduite pour comparer les performances des poulets de chair non traités avec celles d'animaux ayant reçu, à titre prophylactique, deux formulations, triméthoprime et sulphaquinoxaline d'une part, ou amprolium et sulphaquinoxaline d'autre part. Aucune différence significative n'a été observée pour les gains moyens globaux de poids par animal, et pour l'indice de consommation, dans les 3 groupes. Le facteur de productivité était plus élevé pour le groupe traité à l'amprolium-sulphaquinoxaline. Le bénéfice brut était significativement plus élevé dans le groupe triméthoprime + sulphaquinoxaline et, en revanche, plus faible chez les témoins. A l'abattoir, la coccidiose était évidente dans les fèces des trois groupes. En conclusion, si l'emploi prophylactique des coccidiostatiques améliore, chez les poulets de chair, les résultats économiques des éleveurs et réduit les pertes pendant les fréquents épisodes coccidiens, leur utilisation doit être encouragée mais avec prudence afin d'éviter le développement de la chimiorésistance. **Mots clés** : Poulet de chair - Coccidiose - Prophylaxie - Performance - Indice de consommation - Ghana.

Whether this is necessary or not has not been evaluated locally. Furthermore, there is the suspicion of resistance to amprolium which has been on the local market for some years, prompting the marketing of a trimethoprim + sulphaquinoxaline (TS) formulation in 1989 as a substitute. However, REID (4) asserted that the appearance of a few resistant strains does not mean that the usefulness of an otherwise successful coccidiostat is over but rather a controlled floor-pen comparison of the feed efficiency and performance of a flock is the best index of a drug's usefulness.

Our experiment compared feed conversion ratios, average liveweight gains per chick and overall production performances in 3 groups of broilers made up of a control untreated group, another group under TS prophylaxis and a third one kept on amprolium + sulphaquinoxaline (AS).

An economic analysis was done to evaluate the benefits resulting from incorporating these two coccidiostats in a health package for small-scale poultry farmers. Post-mortem observations were also compared. The aim was to evaluate the performance of broilers raised on these two coccidiostats marketed in Ghana.

INTRODUCTION

Poultry coccidiosis is a major cause of unthriftiness and mortality, despite advances made in prevention and control through chemotherapy (4). In Ghana, the disease is acute and causes high mortality in young birds (2). To meet protein requirements and serve as a source of income, small scale poultry farmers, keeping between 200 - 1000 birds at a time and aiming at reaching a marketable size within the shortest period, have chosen exotic breeds which have faster weight gains and higher feed conversion ratios. Coccidiosis, characterized by a decreased weight gain and an impaired feed efficiency (1) is thus a limiting factor to achieving these aims. The threat of coccidiosis is permanent and the only way to prevent the pathological effects or not poor performance is through a continuous or strategic supplementation with drugs (6, 7).

MATERIALS AND METHODS

One day old exotic broiler chicks (n = 150) of the Cobb strain were raised to 10 weeks in pens on deep litter. The chicks were randomly selected into 3 groups of 50 each with 4 replicates per group. Group C was the control with no coccidiostat during the entire period of the experiment. Group T1 was treated with a TS mixture (Trinquin[®], Coopers, England) during the first ten days of life of the chick at the dose of 28 g/200 l of water. Group T2 was kept under AS formulation (Supermed[®], Bremar Pharma, West Germany) at 0.5 g/l water for 3 consecutive days in a week from weeks 2 to 9. These two coccidiostats have been recommended for prophylactic purposes, in addition to their application in curative treatments. Natural infections by coccidia in the environment were allowed to take place so as to mimic the situation prevailing in the local poultry enterprise where no special efforts are made by farmers to prevent coccidiosis *per se* by the methods recommended by REID (5). General poultry husbandry, management and hygienic procedures were followed. The litters were changed when they were very wet or compacted.

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Birds were weighed weekly. The average weekly weight gains per bird were computed and feed conversion ratios were calculated as the relation between the weight of feed consumed and the bird's weight gain (7).

The production efficiency factor was calculated for each group according to SAINSBURY (7). The gross margin was calculated as gross income minus variable costs (8) on the basis of numbers of broilers sold rather than on their liveweights. Statistical analyses made use of Student's t-test to compare the differences at $P > 0.05$.

Parasitism was evaluated at necropsy on the basis of gross lesions in the gastro-intestinal tract of 20 randomly selected birds per group (total = 60 birds). Attempts were made to identify the species of coccidia on the basis of location of lesions (6, 9). Samples of intestinal and caecal contents were taken and prepared for oocyst counting using the modified MCMAS-TER method (3).

RESULTS

Figure 1 shows a graph of the average weekly body weight gain per chick in each group.

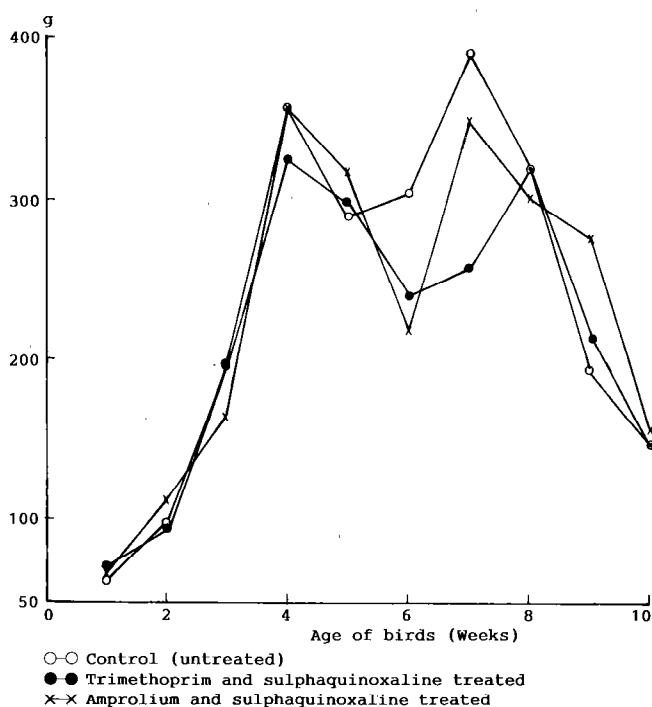


Fig. 1 : Average weekly body weight gain per chick (g).

The control group had significantly higher weight gains ($P < 0.05$) over both treated groups in weeks 6 and 7 but over T1 alone in week 4 and T2 alone in week 3 (fig. 1) Both treated groups had significantly higher weight gains over the control group during weeks 5 and 9. The control group was also significantly lower in weight gain than T1 in week 1 and T2 in week 2, respectively. Group T2 had significantly higher weight gains over T1 in weeks 2, 4, 7 and 9 while the opposite was true in weeks 1, 3 and 6. In weeks 8 and 10, no significant differences were evident in all 3 groups. No significant differences existed between groups C and T1 in weeks 2 and 3 and between C and T2 in weeks 1 and 4.

The average weekly weight gains per chick ($X \pm SEM$) over the experimental period of 10 weeks were 253.2 ± 35.5 g, 214.6 ± 28.2 g and 230.3 ± 32.4 g for groups C, T1 and T2, respectively. No significant differences ($P > 0.05$) were evident.

Figure 2 represents the feed conversion ratios (FCRs) in each group on a weekly basis. The mean FCRs ($X \pm SEM$) were 3.0 ± 0.4 , 3.1 ± 0.4 and 2.7 ± 0.3 for groups C, T1 and T2, respectively. No significant differences ($P > 0.05$) were obtained. The lowest FCRs (implying higher feed efficiencies) were seen in all 3 groups in week 4 while the highest FCRs were seen in week 10 in all the groups.

Table I gives the data for analysis and the value for the production efficiency factors for the 3 groups. Table II shows the gross margin for each group.

Pathological lesions commensurable with coccidial infection were observed in 85, 60 and 70 % of the intestinal samples from groups C, T1 and T2 respectively. Lesions in the caeca were more prevalent. On the basis

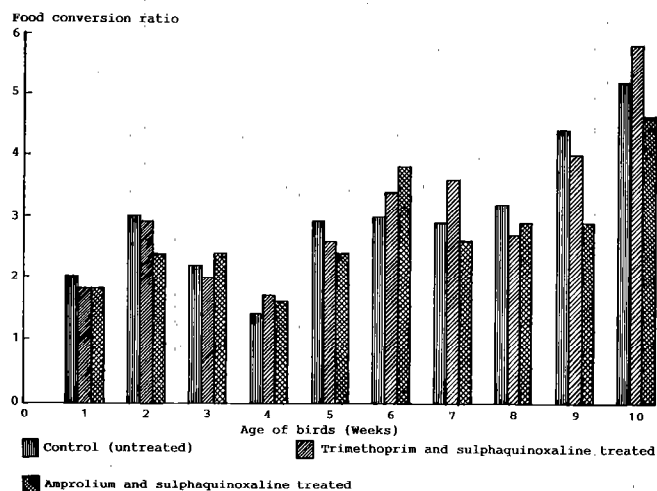


Fig. 2 : Weekly food conversion ratios.

TABLE I Production efficiency factors (PEF) analysis.

Determinants	Group		
	C	T1	T2
Average liveweight	2.4	2.2	2.3
Total liveweight sold (kg)	103.2	110.0	112.5
Number of chicks started	50	50	50
Average age (days)	65	72	71
Total feed used (kg)	301.3	320.5	304.2
Number of broilers sold	43	50	48
PEF	109	105	115

C : control group ; T1 : trimethoprim + sulphaquinoxaline-treated group ; T2 : amprolium + sulphaquinoxaline-treated group.

TABLE II Gross margin (GM).

Group	GM	
C	¢ 17058.65	(US\$56.86)
T1	¢ 24623.65	(US\$82.08)
T2	¢ 20269.40	(US\$67.56)

US \$1 : ¢300.

C : control group ; T1 : trimethoprim + sulphaquinoxaline-treated group ; T2 : amprolium + sulphaquinoxaline-treated group.

of location, *Eimeria tenella* was presumptively identified as the major causal agent. The lesions seen included enlarged and thickened caeca with chocolate brown or bronze coloured faeces having specks of clotted blood ; petechia and ecchymotic haemorrhages in intestines and caeca ; ballooning of caeca and intestines, and white cheesy plugs in the caeca. The latter were a feature seen only in the samples from group T1. No overt haemorrhages were seen in the droppings during the birds' life. However, some of them in each group passed bronze-coloured faeces which pasted the vent. Such birds had ruffled feathers and tended to huddle together.

The average oocyst count for the groups were 60 000, 7 900 and 19 000 oocysts per gram intestinal/caecal content for groups C, T1 and T2, respectively. The oocyst count was remarkably higher in the untreated group than in the treated ones.

The average oocyst counts reported were for the intestinal and caecal content samples taken at the end of the experimental period of 10 weeks. Other data (unpublished) showed the detection of oocyst (implying excretion) in faecal samples from all three groups as early as

end of the first week of the experiment with values of 1 250, 6 300 and 4 700 oocysts/g faecal sample for C, T1 and T2, respectively. Data on weekly average oocysts counts showed no definite patterns and were difficult to interpret.

Deaths were recorded in T1, T2 and C at rates of 0, 4 and 14 %, respectively.

DISCUSSION

Weight gain

Our results did not agree with the assertion that coccidiostats help in improving rate of weight gain, since no significant differences ($P > 0.05$) were seen between birds under prophylactic treatment and untreated. It has been noted that coccidiostats help in improving the rate of weight gain by checking the effects of the infection through eliciting a state of coccidiosis, where a light infection exists with no visible damage but rather some protective immunity is induced in the host (4). However, a decrease in the rate of weight gain is more evident in moderate to severe coccidial infections but not so obvious in lightly infected birds (4). The clinical signs observed in our experiment suggested the presence of light to moderate infections.

Although caecal coccidiosis caused by *Eimeria tenella* was observed in both treated and untreated groups, the lesions were more profound and prevalent in the untreated controls. Rather than point to the existence of resistant strains, the phenomenon of both treated and untreated groups showing lesions could be explained by the fact that the drugs were used at prophylactic dosages which enabled the establishment of light infections instead of completely eliminating the coccidia.

BAFUNDO and DONOVAN (1) reported that experimental infections with high and low dose levels of *E. tenella* produced only moderate reductions in body weight with the low dose having no adverse effect. Furthermore, the higher dose level impaired performance more, but even under these conditions, weight gain was not affected to the extent of an infection of equal severity caused by the intestinal species of coccidia, for example *Eimeria necatrix* and *E. acervulina*.

This is because the caeca play a relatively minor role in the absorption of nutrients. Consequently, impaired nutrient absorption and its effects on bird performance are not manifestations of an *E. tenella* infection while they are of prime importance in intestinal coccidiosis where absorption is hampered. This may explain the

absence of significant differences between treated birds and untreated controls (7, 11). This was not evident in our findings.

Feed Conversion Ratio (FCR)

SAY (8) stated that FCR is between 1 and 2 for birds of 3 weeks and below in age and can exceed 3 at the end of the growing period. In our experiment, the FCRs were between 1 and 3 in all 3 groups up to the age of 5 weeks and generally exceeded 3 from 6 weeks onwards. SAINSBURY (7) found that a better feed efficiency was obtained in poultry strategically medicated with potentiated sulphaquinoxaline (TS mixture) as compared with an untreated group. Again, this was not obvious in our study. The reasons advanced for the absence of any significant difference in live weight gain in our study could also hold for that in FCR, as noted by BAFUNDO and DONOVAN (1).

Production Efficiency Factor (PEF)

The PEF values of 109, 105 and 115 obtained in groups C, T1 and T2, respectively, were significantly lower than that of 198 for untreated broilers in the United Kingdom reported by SAINSBURY (7). No values for PEF in other countries, especially developing countries, were available.

It is known that below a certain bird population, production in a poultry enterprise is inefficient, but as the population increases the efficiency will grow till a decline sets in. It is suspected that the low PEF in our study might have resulted from using a sample size below the minimum number for efficient production. However, the sample size of 50 birds per treatment was representative enough in our region since most small-scale farmers keep 200-1000 birds at a time. In our situation, PEF might not be an appropriate or useful parameter for measuring performance.

Gross Margin (GM)

This is the most useful economic indicator drawing the farmers attention to the problems of their enterprise and offering solutions to them (8). In this study, group T1 had a better GM followed by groups T2 and C, respectively. Similar superiority of a TS treatment in economic benefits in comparison with other coccidiostats has been reported (7).

Poultry sale by weight is not practised in Ghana. Birds are sold at flat rates regardless of weight. In this case, a treatment that minimized loss through mortality and therefore increased economic returns is preferable. In this study, medication with the TS mixture proved to be better than

the others in this respect since the mortality was nil in this group. A higher GM and a shorter duration for strategic medication would make the TS mixture more attractive to the farmer as compared with AS.

Post mortem findings, oocyst production and mortality rates

Although the gross pathological lesions observed at slaughter were not entirely pathognomonic of coccidiosis, they agreed with those reported for the disease (4, 9, 10). *E. tenella* was presumptively identified as the most common causal agent because of the high prevalence of caecal coccidiosis. The white cheesy caecal plugs seen in T1 gave an indication of the chronic nature of the disease (9).

There were significant differences in the average number of oocysts in the intestinal/caecal content samples obtained at slaughter. The untreated group had higher numbers of oocysts. The relatively lower numbers recovered from the treated groups may be due to the effect of coccidiostats in suppressing the number of coccidia in the host to a level that would not result in clinical coccidiosis but rather a state of coccidiasis where production of protective immune factors resulted in premunity (6). Hence, oocysts were recovered from the treated groups as well as the untreated group but at significantly lower levels.

The absence of any mortality in group T1 could be explained by the assertion of SAINSBURY (7) that the antibiotic protection provided by a TS medication given early in life expanded through the life of the chick resulting in reduced mortality. The two deaths recorded in group T2 were attributed to coccidiosis and could indicate some resistance to amprolium. In the control group, out of 7 deaths, 5 were diagnosed as caused by coccidiosis and the other 2 were due to other causes. Caecal coccidiosis is generally acute and has a high mortality rate (9). From our finding of high prevalence of caecal coccidiosis, this should have resulted in higher numbers of deaths, at least in the control group, than recorded. Mortality rates of up to 52% have been reported (2). It is therefore postulated that either a light infection prevailed even in the control group or a moderately pathogenic *E. tenella* was responsible. *E. tenella* is reportedly highly pathogenic and causes high mortality or overt blood loss (1), but these were not obvious in this study.

CONCLUSION

The study showed that, contrary to reported findings, no significant differences were seen between the two main parameters for performance, the average weekly weight

gains and feed conversion ratios between untreated and prophylactically treated birds. Appreciable differences were, however, evident by the reduction in the death rates in the chickens since the broilers under coccidiostat treatment had 0-4 % mortality rate compared to 14 % for those not treated. Since farmers in Ghana are more concerned about numbers that survive to sales time rather than the weight of birds, it appeared that the use of coccidiostats was beneficial from this point of view. Coccidiostats will also help in preventing serious losses during severe outbreaks. Therefore, where outbreaks are common and frequent as in our region, it may be advisable to have routine prophylactic treatment. On these bases, we think that the use of coccidiostats in strategic

medication should be encouraged since it improved the profit margin, a parameter of great importance to the farmer.

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TURKSON (P.K.), OSAFO-ADU (A.). Evaluation of performance in broilers kept on prophylactic medication with coccidiostats. *Revue Élev. Méd. vét. Pays trop.*, 1991, **44** (4) : 491-496

Poultry coccidiosis is characterized by depressed weight gain and impaired feed efficiency. To offset losses from this disease, chemotherapy has been recommended. Coccidiostats with amprolium base have been in use in Ghana for some years. A trimethoprim + sulphaquinoxaline mixture was recently introduced as a substitute due to fears of resistance to amprolium. A study was undertaken to compare performance of broilers not treated with coccidiostats and those treated prophylactically with either a trimethoprim + sulphaquinoxaline or amprolium + sulphaquinoxaline formulation. No significant differences were observed in the overall average liveweight gains per bird and the feed conversion ratios in the three groups. The production efficiency factor was highest in the group under amprolium + sulphaquinoxaline medication. The gross margin was significantly higher in the trimethoprim + sulphaquinoxaline group and least in the control group. Caecal coccidiosis was evident at slaughter in all three groups. It was concluded that since the prophylactic use of coccidiostats in broilers improved the economic returns of farmers and would offset losses during the frequent outbreaks of coccidiosis, their use should be encouraged but judiciously to avoid problems of development of resistance. *Key words* : Broiler - Coccidiosis - Prophylaxis - Performance - Feed conversion ratio - Ghana.

TURKSON (P.K.), OSAFO-ADU (A.). Evaluación de la calidad de los pollos de engorde mantenidos bajo medicación profiláctica con coccidiostatos. *Revue Élev. Méd. vét. Pays trop.*, 1991, **44** (4) : 491-496

La coccidiosis aviar se caracteriza por una disminución en la ganancia de peso y una eficiencia alimenticia irregular. Se ha recomendado la quimioterapia como medida para compensar las pérdidas ocasionadas por esta enfermedad. Durante algunos años, en Ghana se han utilizado coccidiostatos a base de amprolium. Recientemente se introdujo una mezcla a base de trimetoprim y sulfaquinoxalina como sustituto, debido a la posibilidad de resistencia al amprolium. Se inició un estudio para comparar la eficiencia de pollos de engorde no tratados con la de animales profilacticamente tratados sea con trimetoprim y sulfaquinoxalina, sea con amprolium y sulfaquinoxalina. No se observaron diferencias significativas ni en la ganancia total promedio por ave, ni en la tasa de conversión alimenticia en los tres grupos. El factor de eficiencia productiva fue mayor en el grupo bajo amprolium y sulfaquinoxalina. El alcance total fue significativamente más alto en el grupo tratado con trimetoprim y sulfaquinoxalina y menor en el grupo control. La coccidiosis cecal se evidenció en matadero en los tres grupos. Dado que el uso profiláctico de coccidiostatos en pollos de engorde mejora las ganancias económicas de los productores y disminuye las pérdidas durante los frecuentes brotes de coccidiosis, se concluye que el uso de éstos debe recomendarse, pero cuidadosamente, para evitar el desarrollo de resistencias. *Palabras claves* : Pollo de engorde - Coccidiosis - Profilaxis - Eficiencia - Tasa de conversión alimenticia - Ghana.

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