Effects of Supplementing Garlic Pulp and Aloe Vera Jelly in Drinking Water on Feed Intake, Growth Rate and Carcass Characteristics of Finished Broilers

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Abstract

The experiment was conducted to investigate the effects of using garlic pulp and aloe Vera jelly in drinking water on feed intake, growth rate, and carcass characteristics of finished broilers. A total of 225 broilers aged 21 days were randomly allotted into three treatments each replicated thrice with 25 birds per replicate during 35 days under observation to attain 56 days old. The experimental birds were assigned to three treatments i.e. T1 offered 2g/l of Aloe vera jelly, T2 garlic pulp, and T3 1g/l of oxytetracycline 20% in drinking water during 22nd to 26th days as the first dose, followed by the second dose on 49th-53rd day. On the 56th day thirty birds (ten from each treatment) were randomly picked and purposively slaughtered to determine carcass characteristics. There was no significant difference ($p<0.05$) for the use of garlic pulp, aloe Vera jelly, and oxytetracycline in drinking water on feed intake, growth rate, and carcass characteristics of the experimental broilers. Therefore it is concluded that the inclusion of aloe vera jelly and garlic pulp in drinking water at the used rate in this study has no significant effect on feed intake, weight gain, and carcass characteristics on finishing commercial broilers. Possibly, to impose a desirable effect on the variables under the study, higher supplementation and a prolonged period of administration of the used herb and spice could bring about positive effects on the study variables.

Keywords: Feed intake, growth rate, and carcass characteristics

Introduction

The poultry industry has been growing throughout the world following an increase in population which demands quality foods to promote health and general well-being. With this respect, producers have adopted emerging technologies that address the need for an increase in the quality and quantity of the products. Among the efforts involved the use of herbs and spices incorporated in drinking water or as feed additives to replace the use of antibiotics as growth promoters (AGP), particularly broiler chickens. The components in herbs/spices such as antioxidants and other chemicals have a substantial influence on immunity and growth performance (Jalal *et al.*, 2019).

In a study conducted in Egypt by Amber *et al*., (2021), used aloe vera gel at the rate of 1.5% in drinking water had significant improvement in final body weight and feed conversion ratio compared to control and 1% of the inclusion. In addition, total blood protein and albumin had higher values for the aforesaid treatment and also showed to have lower total blood cholesterol, triglycerides, and LDL. Findings reported by Paul (2019) showed improved performance on body weight, feed consumption, body weight gain, and feed conversion ratio of the broiler offered a combination of 0.5% each aloe vera and garlic.

Among the important spices mostly available in tropical countries, garlic has been shown to have multiple uses in humans and animals. Garlic has bioactive components including essential oils and allicin (Ogbuewu *et al*., 2019) effective against enteric microorganisms and also as an antioxidant,

consequently found to promote growth and improve the immunity of the animals. Several herbs have been shown to produce positive effects in animal production studies (Kim et al., 2013; Ali *et al*., 2019; Andrew *et al*., 2020). A study conducted in South Africa by Walia *et al*., (2021), reported significant improvement in egg and albumin weight for layers supplemented with a garlic powder diet at 3 and 5%. Broiler fed diet supplemented with garlic at 5g, 10g, and 15g/kg in Ethiopia, showed improvement in average feed intake, weight gain, and final live weight than those on the control diet (Dolle, 2020). The correct dose for the ingredients has not yet been established. Therefore, this study aimed to determine the effects of garlic pulp and aloe Vera jelly in drinking water on feed intake, growth performance, and carcass characteristics of finished broilers and specifically assess feed intake, growth performance, and carcass characteristics of the experimental broilers.

Materials and methods

Study Area

The study was conducted at Zanzibar Livestock Research Institute (ZALIRI) about 15 kilometres from Zanzibar Town. The Institute is situated at latitude 60 south, longitude 390 55 east, and 20m above sea level. The area receives an average rainfall of 1,564 mm/annum and 56an annual average temperature of 25.7°C.

Experimental design and treatments used

The study was executed using Completely Randomised Research Design (CRD). The chickens were reared in a research-designed poultry house in nine pens each with 25 birds while a stocking density of 6.25 birds. The study had three treatments (T1, T2, and T3) with 75 birds per treatment, assigned into three replicates of 25 birds each. Treatment one (T1) was assigned to aloe vera jelly, Treatment two (T2) was garlic pulp while Treatment three (T3) was conventional (Oxytetracycline 20% powder) used in drinking water. Administration of the aforementioned treatment was done for 5 consecutive days i.e. 22nd to 26th days as the first dose, followed by the second dose on the 49th-53rd day at an inclusion rate of 2g/litter for aloe vera and garlic and 1g/litter for oxytetracycline 20%.

Source of feeds and feeding

The birds were offered Broiler finisher pellet feed compounded from a commercial feed mill in Dar-es-salaam and purchased from an Agro service provider in Zanzibar town. The broilers were fed ad libitum daily to explore their potential. The feed was weighed recorded and offered daily in the morning at 7:30 and the residues were collected and weighed the next day at the same time.

Source, preparation, and feeding of the aloe vera jelly and garlic pulp

Aloe Vera jelly used in the study was collected from a nearby farm at the Agriculture exhibitions ground just 200m from ZALIRI station while Garlic was purchased from the market. The aloe vera leaves were washed clean, dried then peeled off the outer cover to obtain jelly material which was then weighed, ground, and mixed with a predetermined amount of drinking water for broilers. Garlic was peeled off to obtain the pulp, weighed, ground, and mixed with a calculated amount of drinking water, and offered to the broilers.

Chemical composition of the experimental diet

Three samples of Broiler Finisher Feed (pellets) weighing 250 grams were taken randomly from three different bags and sent to the Tanzania Veterinary Laboratories Agency (TVLA) in Dar-es-salaam for chemical analysis. The samples were preserved in plastic bags and were tightly closed to prevent oxidation, damage, and loss during transportation.

Source of experimental birds and their management

The study was conducted in an open-sided research-designed poultry house under a deep litter system. The broiler chickens (Ross 308) were vaccinated against ND and Gumboro diseases at the age of 7th and 12th days respectively then supported with multivitamins. Additionally, prophylactic medication (Amprosulfa) against coccidiosis was used from the 15th to 17th day old. The chicken in the experiment

was allotted into the research pens at the age of 21 days while attaining an average live weight of 1,000g for all treatments. The experimental period for the broilers was from the 22nd to the 56th day while fed broiler finisher pellets.

Slaughter procedure used in the study

After eight weeks of age, 10 broilers were randomly picked from each treatment for slaughter to assess carcass characteristics. Halal slaughtering procedure was used, thereafter bleeding was facilitated by hanging them for 3 minutes. After slaughter, each bird was soaked in hot water at (70ºC) for 2 minutes followed by the removal of feathers. The feet were carefully cut off at the tibia-femur joint, thereafter the abdomen was incised at the mid-ventral using a sharp knife, and then the whole gastrointestinal tract was removed. Plucking and evisceration were done properly under hygienic environmental conditions and hot carcass weight (HCW) was recorded for individual broilers. Half carcass weight (HFCW) was determined by dividing 102 the hot carcass through the median plane. The left side was picked for weight measurement 103 and then dissected into drumstick, thigh, and brisket components.

Variables measured for the experimental broilers

Feed intake of the experimental broilers

Feed intake was determined by weighing the amount of feed offered less feed refusal in each pen (replicate) daily. Moreover, the Feed conversion ratio (FCR) was obtained by dividing the total feed intake by the total weight gain of all birds in each pen

$FI=FO-FR$ .....(1)

Whereby: - FI = Feed intake, FO = Feed offered, FR = Feed residue

$FCR=FI/WG$ .....(2)

Whereby: - FCR = Feed conversion ratio, FI = Feed intake and Weight gain

Weight gain of the experimental broilers

Initial weight during the allotment of birds to their respective treatments was taken and recorded. The weekly weight gain of the chicks was measured at 28th, 35th, 42th, 48th, and 56th days. Cumulative weight gain was calculated as final weight less initial weight while daily weight gain was determined by dividing the cumulative weight gained by the number of days in the study period i.e. 35 days.

$CWG=FW-IW$ .....(3)

Whereby: - CWG = Cumulative weight gain, FW = Final weight and IW = Initial weight

$ADG=CWG/NDs$ .....(4)

Whereby: - CWG = Cumulative Weight Gain, ADG = average daily weight gain g/d (growth rate) and NDS =Number of days during the experiment (35)

Carcass characteristics of the experimental broilers

Variables used to assess carcass characteristics were weights of the hot carcass, half carcass, brisket, thigh, and drumstick. The digital weighing balance with a 5-gram difference calibration was used to measure the aforementioned variables. The variables were 128 recorded in the record sheet and stored for further analysis. Carcass dressing percentage (DP 129%) was calculated as the weight of carcass over slaughter weight as a percentage.

$DP=CW/SW*100$ .....(5)

Whereby: - DP = Dressing percentage, CW = carcass weight; and SW = Slaughter weight.

Data analysis

Data on feed intake, growth rate, and carcass characteristics were analysed using Statistical Analysis System (SAS, 2002) software. Data were taken and recorded and later entered in the Excel spreadsheet for processing. Furthermore, data were transferred to SAS software for Analysis of Variance (ANOVA). General Linear Model (GLM) was employed in the analysis i.e.:

$Yij= \mu+Ti+eij$ .....(6)

Whereby: - Yij =Response variable, μ = General mean, Ti = Treatment effect and Eij = Random error

Results

The broiler finisher feed was in the normal range sufficient to keep the experimental birds in good maintenance and growth conditions. The values for each of the variables under examination are presented in Table 1. Overall,

the feed had a high level of valuable nutrition variables, energy, and crude protein.

Table 1: Chemical composition of the broiler finisher feed used in the study

Nutrient Description	Amount (%)
Broiler finisher feed	
DM	89.2
Ash	2.5
Metabolizable energy (Kcal/kg DM)	3221.0
STH	45.4
TS	3.8
CP	20.1
EE	5.8
CF	4.5

DM = Dry matter, ASH = Minerals, Kcal = Kilocalorie, STH = Starch, TS = Total sugar, CP = Crude protein, EE = Ether extract and CF = Crude fibre

There were no significant differences ($p>0.05$) for all variables determined between treatments.

T1 Treatment no 1, T2 = Treatment no 2, T3 = Treatment no 3, IWT = Initial weight, FWT = Final Weight, CWG = Cumulative weight gain, and ADG = Average daily gain.

Table 2: Feed intake variables of the experimental broilers under different treatments

Treatment	T1	T2	T3	SEM	P-Value
AFI (g)	167.6	175.4	172.7	6.1	0.6596
TFI (g)	5.533	5.789	5.699	202	0.6632
CWG (g)	2.943	3.055	3.022	47.8	0.2413
FCR (g)	1.90	1.93	1.93	0.08	0.9438

[ab] *Means in the same row with different superscripts are significantly different ((P<0.05)*

T1= Trtreatment no 1, T2 = Treatment no 2, T3 = Treatment no 3, AFI = Average feed intake, TFI = Total Feed intake, CWG = Cumulative Weight Gain, and FCR = Feed Conversion Ratio.

The following table illustrates the results of weight variables used, that is initial weight, final weight, cumulative, and average daily weight gain for the three treatments. Likewise, there were no significant differences, ($p>0.05$) between treatments.

The following table presents the results of carcass characteristic variables used, there is no significant ($p>0.05$) difference between the treatments.

T1 Treatment no 1, T2 = Treatment no 2, T3 = Treatment no 3, SLW = Slaughter weight, DP (%) = Dressing out percentage, HCW = Hot carcass weight, HFCW = Half carcass weight, BRK = Brisket, THG = Thigh, and DSK = Drumstick.

Table 3: Weight gain variables of the experimental broilers under different treatments

Treatment	T1	T2	T3	SEM	P-Value
IWT (g)	1,006	0.998	0.994	10.8	0.7144
FWT (g)	3.950	4.054	4.016	46.6	0.2842
CWG(g)	2,944	3.055	3.022	48.2	0.2413
ADG(g)	84.1	87.3	86.3	1.3	0.2410

[ab] *Means in the same row with different superscripts are significantly different ((P<0.05)*

Table 4: Carcass weight variables of the experimental broilers for the different treatments

Treatment	T1	T2	T3	SEM	P-Value
SLW(g)	3.9528	4.0542	4.0994	0.1813	0.2916
DP (%)	71.30	71.2	71.1	0.002	0.0921
HCW (g)	2.7354	2.9200	2.9310	0.129	0.2444
HFCW(g)	1.4398	1.5188	1.5426	0.067	0.2443
BRK(g)	0.6180	0.635	0.628	0.031	0.0638
THG(g)	0.251	0.266	0.272	0.011	0.0636
DSK(g)	0.1729	0.1842	0.1850	0.0081	0.2393

[ab] *Means in the same row with different superscripts are significantly different ((P<0.05)*

Discussion

The chemical composition of the broiler finisher feed used in the study is in line with Chang'a *et al*., (2019) who fed the commercial finisher diet from the 25th to the 35th day under a controlled environment. Comparatively, the current feed had slightly excess energy of 21kcal/kg and 0.5% crude protein values. In a study conducted by Uchewa *et al.*, (2018) finishing broilers at 8 weeks had a lower energy value of 2,897kcal/kg and higher 15%CP than the current feed. The current feed is in line with the standard set for broiler finisher feed. The feed intake of the feed used by Uchewa et al., (2018) was lower in energy by 34% compared to the current study. The high intake of the feed used in the current study might be attributed to the processing technique (pellet) which results in high feed intake, high palatability, and decreased particle loss and selectivity (Rojas and Stein, 2017).

Weight gain of the experimental broilers was not affected by the treatments contrary to the study reported by Pagrut et al., (2018) where incorporated 0.5kg and 1kg (0.05 and 0.1%) garlic per ton of broiler feed resulted in a significant increase in weight gain. Another study conducted by Zayed *et al.*, (2020) using aloe vera jelly extract in drinking water at the dosage rate of 15mls/litter showed increased weight gain and feed efficiency. The insignificant difference noted in the current study might be attributed to the period of administration which was a short and lower rate of aloe vera jelly and garlic pulp.

Carcass characteristic variables showed no significant difference among the treatments. These results concur with the study reported by Taufik and Maruddin (2019) who supplemented garlic suspension in drinking water at 3% to 9%. Moreover, Sangilimadan *et al*., (2019) incorporated garlic pulp paste at the rate of 0.25% and 0.5% in feed ended with no significant effect on the improvement of carcass variables, except for thigh yield which showed a significant difference ($p<0.05$). On the other hand, Edeh *et al*., (2021) reported a significant difference in carcass weight variables supplementing aloe vera jelly extract in drinking water at a 30% dosage rate. The obtained results might be attributed to the short time of administration and lower dosage of the used herbs and spices i.e. aloe vera jelly and garlic pulp.

Conclusion

It is concluded that the inclusion of aloe vera jelly and garlic pulp in drinking water at the used rate in this study has no significant effect on feed intake, weight gain, and carcass characteristics on finishing commercial broilers.

Recommendations

Based on the study findings and literature searched, propose the need to conduct further studies on the related topic, possibly checking on the levels of aloe Vera and garlic in the diets.

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Conflict of interest

The authors declare no conflict of interest to this publication.

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