EFFECT OF DIETARY INCLUSION OF GARLIC, SYNBIOTIC, ORGANIC ACIDIFIER AND SYNTHETIC ANTIBIOTICS ON CARCASS AND CAECAL MICROBIAL LOAD OF FUNAAB ALPHA CHICKENS

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ABSTRACT
This study was carried out to determine effect of garlic, synbiotic, organic acidifier and synthetic antibiotics on carcass characteristics and caecal microbial load of FUNAAB-Alpha chickens. One hundred and fifty day-old broiler chicks were randomly divided into 5 treatments of 3 replicates with 10 chicks and laid out in a Completely Randomized Design. Treatments consisted of birds on Treatment 1 (T0 - no additives), Treatment 2 (Tg - garlic at 3g/1kg feed), Treatment 3 (Ts - synbiotic at 2g/1kg feed), Treatment 4 (Toa - organic acidifier at 3g/2kg feed), Treatment 5 (Ta - antibiotics at 0.5g/1kg feed). Data obtained were subjected to one way analysis of variance. Birds on Ta showed significantly ($p<0.05$) increased plucked weight, eviscerated weight and dressed weight percentages similar to same parameters in birds on Ts and Tc. Weights for head, back, breast, gizzard, lungs, small intestine were also significantly ($p<0.05$) increased. Neck and caecum weights were significantly ($p<0.05$) lowered in birds on Ta. Birds on Ts showed significantly ($p<0.05$) increased weight for neck and it was same for kidney and caecum weights of birds on Tg. Streptococcus faecalis for birds fed Toa and Salmonella spp for birds fed Tg was significantly ($p<0.05$) lowered in their caecum. In conclusion, for FUNAAB-Alpha chickens, synbiotic improved carcass yield similar to antibiotic inclusion in diet; synbiotic and organic acidifier improved breast muscle similar to antibiotic inclusion in diet; additive inclusion lowered Streptococcus faecalis and Salmonella spp. population in the caecum.
Keywords: Garlic, synbiotic, organic acidifier, antibiotics, FUNAAB-Alpha chickens

INTRODUCTION
Feed additives are added in poultry feeds to improve nutritive value of ingredients and enhance performance in poultry by increasing growth rate and improving feed conversion efficiency (Odunowo and Olumide, 2019). The removal of AGPs from poultry feeds have left poultry more vulnerable to mortality and diseases (Nisar *et al*., 2021) due to increase in microbial load. Numerous tests have been conducted with good success on the effects of additives such as antibiotic, synbiotic, organic acidifier and phytogenic supplementation on different breeds of chicken, but information is still limited on their effects in improved indigenous chicken like the FUNAAB Alpha. This study is therefore designed to determine the effect of dietary inclusion of garlic, synbiotic, organic acidifier, and synthetic antibiotics on carcass and caecal microbial load of FUNAAB Alpha broiler chickens

MATERIALS AND METHODS
The experiment was carried out at the Poultry Unit of the Institute of Food Security, Environmental Resources and Agricultural Research (IFSERAR), Federal University of Agriculture, Abeokuta (FUNAAB). The location lies within latitude 7.230085^0N and longitude 3.399006^0E. Fresh garlic was sourced from an open market in Abeokuta, minced and oven dried at 55^0C until a uniform weight was achieved. The dried garlic was grounded into powder and included in broiler basal diet. Synthetic synbiotic (Innovad Lummance), organic acidifier (Formycine Gold Px) and antibiotic (Keproceryl) were each purchased from a reputable agro-allied/ veterinary shop. All three products were used according to manufacturer's recommended dose for poultry. One hundred and fifty (150) day old FUNAAB Alpha broiler chicks were purchased from FUNAAB hatchery. Brooding lasted fourteen days. Clean water and feed were provided ad-libitum throughout. Routine medication and vaccination schedules were also ensured. Broilers were weighed on arrival and assigned into five treatments with

three replicates of ten chicks each. Broiler starter and finisher mash containing test ingredients: garlic (*Allium sativum*) powder, synthetic synbiotic, organic acidifier and antibiotics were fed to the chicks throughout the 7-week experimental period. The treatments were: Treatment 1 (T_0 - no additives), Treatment 2 (T_g - garlic at 3g per 1kg feed), Treatment 3 (T_s - synbiotic at 2g per 1kg feed), Treatment 4 (T_{oa} - organic acidifier at 3g per 2kg feed), Treatment 5 (T_a - antibiotics at 0.5g per 1kg feed). At the end of the experiment, data was collected to evaluate carcass characteristics and caecal microbial culture and all data obtained were subjected to Analysis of Variance (ANOVA) in a Complete Randomized Design. Significant means amongst treatments were separated using Duncan's multiple range test as contained in SAS (2012) package.

RESULTS AND DISCUSSION

Tables 2, 3 and 4 show effects of dietary inclusion of garlic, symbiotic, organic acidifier, and synthetic antibiotics on carcass yield, cut-up parts, organs, offals and caecal microbial load of FUNAAB Alpha Broilers respectively. Birds on T_a were significantly ($p<0.05$) increased for plucked weight, eviscerated weight and dressed weight percentages and this was comparable for the same parameters in birds on T_s and T_c. Highest values of carcass yield in antibiotic treatment corresponds to the positive effects of antibiotic use on carcass weight stated by Woodward *et al*. (1988). Trend for increased ($p<0.05$) values for birds on T_a was same for head, back, breast, gizzard, lungs, small intestine and with comparable values of increased weights in T_0, T_s and T_{oa} for breast weight. Cheng *et al*. (2017) and Salah *et al*. (2019) reported the positive impact of supplementing broiler diets with synbiotic or synbiotic plus organic acid on carcass and breast muscle yields. This may be attributed to symbiotic supplementation in broiler diet improving digestive function because it could provide more available nutrients for muscle growth. Significantly ($p<0.05$) lowered weights for neck and caecum were observed in birds on T_a. Weights were significantly ($p<0.05$) highest for neck in birds on T_s and for kidney and caecum in birds fed T_g. This contrasts with Tayeri *et al.* (2018) report that no significant influence was observed in broiler organ weight after feeding diets supplemented with antibiotics, probiotic, synbiotic and prebiotic.

Table 2: Effects of garlic, synbiotic, organic acidifier, and synthetic antibiotics on the carcass yield and cut-up parts of FUNAAB-Alpha chickens

Parameters	Control	Garlic	Synbiotic	Organic acidifier	Antibiotics	SEM
Carcass yield						
Live Weight (g)	1603.33	1518.33	1575.00	1466.67	1480	25.19
Plucked Wt (g)	1474.50	1361.83	1455.67	1328.17	1481.83	28.76
Plucked Wt (%)	91.96^{ab}	89.51^{b}	92.39^{ab}	90.53^{b}	100.72^{a}	1.42
Eviscerated Wt(%)	78.84^{ab}	74.82^{b}	78.80^{ab}	76.38^{ab}	83.60^{a}	1.23
Dressed Wt(%)	66.58^{ab}	59.92^{b}	65.56^{ab}	63.20^{b}	70.79^{a}	1.18
Cut parts (% of LW)						
Head	2.69^{b}	2.82^{b}	2.84^{b}	2.80^{b}	3.29^{a}	0.06
Shank	4.03	4.11	4.03	4.31	4.70	0.10
Neck	5.52^{ab}	5.56^{ab}	6.27^{a}	5.56^{ab}	5.01^{b}	0.13
Wings	9.70	9.15	9.12	9.36	9.69	0.14
Back	12.72^{b}	12.29^{b}	12.37^{b}	12.16^{b}	14.70^{a}	0.32
Breast	20.93^{a}	17.97^{b}	21.14^{a}	19.57^{ab}	21.78^{a}	0.47
Thigh	11.27	10.63	10.72	10.74	11.69	0.16
Drumstick	10.07	10.28	10.60	10.10	11.24	0.19

a,b, Means with different superscript are significantly different at $p<0.05$, SEM: Standard Error of Mean; Eviscrted Wt: Eviscerated weight

In broilers, pathogenic microorganisms reduce growth rate and health status by producing toxins, utilizing nutrients, and suppressing beneficial microbes that synthesis vitamins or other growth factors. Intestinal microflora stabilization is therefore critical to intestinal health and function (Poula *et al*., 2021). Significantly ($p<0.05$) lowered value of *Streptococcus faecalis* was observed in caecum of birds on T_{oa} whilst *Salmonella spp* was lowered for birds in the T_g fed group. Dieumou *et al*. (2009)

reported lower levels in caecum microbe specie for broilers fed diet with organic acid and decreased *Salmonella spp* population in ileo-ceacal region of broilers fed ginger and garlic essential oils.

Table 3: Effects of garlic, synbiotic, organic acidifier, and synthetic antibiotics on the organs weight and offals of FUNAAB-Alpha chickens

Parameters	Control	Garlic	Synbiotic	Organic Acidifier	Antibiotics	SEM
Organs (% of LW)						
Gizzard	3.16^{b}	3.14^{b}	3.29^{ab}	3.13^{b}	3.62^{a}	0.07
Heart	0.49	0.55	0.47	0.52	0.51	0.02
Liver	2.37	2.07	2.09	2.20	2.78	0.09
Spleen	0.23	0.21	0.53	0.17	0.25	0.06
Kidney	0.66^{ab}	0.76^{a}	0.68^{ab}	0.56^{b}	0.72^{ab}	0.03
Proventriculus	0.51	0.51	0.48	0.50	0.58	0.02
Lungs	0.51^{b}	0.55^{ab}	0.56^{ab}	0.56^{ab}	0.67^{a}	0.02
Abdominal Fat	1.05	1.36	1.33	1.37	1.33	0.13
Offals (% of live weight)						
Caecum	0.64^{ab}	0.79^{a}	0.57^{b}	0.63^{ab}	0.58^{b}	0.03
Small Intestine	3.52^{b}	4.07^{ab}	3.88^{b}	3.84^{b}	5.07^{a}	0.19
Large Intestine	0.17	0.20	0.21	0.24	0.28	0.02

^{a,b,} Means with different superscript are significantly different at $p<0.05$, SEM: Standard Error of Mean

Table 4: Effects of garlic, synbiotic, organic acidifier, and synthetic antibiotics on caecal microbial load of FUNAAB-Alpha chickens

Parameters	Control	Garlic	Synbiotic	Organic Acidifier	Antibiotics	SEM
TBC	2.2	1.7	2.17	1.77	1.83	0.09
Pseudomonas spp.	0.20	0.17	0.30	0.27	0.2	0.04
E. coli	0.43	0.67	0.63	0.60	0.17	0.10
Streptococcus faecalis	0.33^{ab}	0.53 ^{ab}	0.30 ^{ab}	0.13^{b}	0.70^{a}	0.08
Salmonella spp.	0.83^{a}	0.13 ^{b}	0.60 ^{ab}	0.70 ^{ab}	0.40 ^{ab}	0.09
Micrococcus spp.	0.40	0.20	0.33	0.07	0.37	0.06
Eimeria spp.	2333.33	4166.67	8966.67	1333.33	5200.00	1680.16
Eimeria spp/1000	2.33	4.17	8.97	1.33	5.20	1.68

^{a,b,} Means with different superscript are significantly different at $p<0.05$, SEM: Standard Error of Mean TBC= Total bacteria count

CONCLUSION

Based on the results of this study it can be concluded that synbiotic feed additive improved carcass yield (plucked weight, eviscerated weight, dressed weight) of FUNAAB Alpha broiler chicken comparable to antibiotics and the control diet. Synbiotic and organic acidifier improved breast muscle similar to antibiotic inclusion in FUNAAB Alpha chicken. Garlic, synbiotic, organic acidifier and synthetic antibiotics inclusion in the diet had significant effect on caecum *Streptococcus faecalis and Salmonella spp.* population of the birds.

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