THE EFFECT OF ALOE VERA LEAF EXTRACT ON THE GROWTH TRAITS OF THREE CHICKEN GENOTYPE CHALLENGED WITH SALMONELLA

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ABSTRACT
Aloe vera is gaining popularity in poultry production due to their potential to improve growth performance and overall health. However, limited research has explored the effects of Aloe vera extract on growth traits of chicken genotypes. Therefore, this study aims to investigate the influence of Aloe vera extract on Salmonella infection on the growth of broiler, inbred and local chickens. 600-day old chicks, comprising 200 individuals from each genotype aforementioned, were assigned to four treatment levels of Aloe vera extract (0, 10mL, 15mL and standard drug). Birds were fed broiler starter at 0-4 weeks and broiler finisher from 0 to 8 weeks. The study lasted for 8 weeks. The body weights of the broiler at starter phase was significantly (p<0.05) higher at weeks 0, 1 and 4, but statistically (p>0.05) similar at weeks 2 and 3 with the inbred. The body weight of broilers and inbred chicken at weeks 1 to 4 were significantly (P> 0.01) higher than local chicken. At the finisher phase body weight of broilers exhibited significant (p<0.05) higher values across all weeks, followed by inbred chickens. Broilers feed consumption was significantly (p<0.05) higher than inbred, which was significantly (p<0.05) higher than local chickens. The findings on interaction suggest that different treatments could have varying impacts. The competing growth between the inbred and broiler at the early ages (2 to 3) consolidates the predictive accuracy of the on-going breeding program among the inbred population. Hence breeders may achieve optimal expression of inbred traits using better environment.
Keywords: Aloe vera; Body weight; Breeds; Salmonella; Chicken

INTRODUCTION
The primary route of Salmonella transmission to humans is through the consumption of undercooked or improperly handled poultry products. For many years, commercially available antimicrobial drugs have been used to control this pathogen and other related diseases. The emergence of drug resistance in pathogens, combined with rising consumer demand for safe food, has compelled the development of new antimicrobial agents (WHO 2020). In addition, certain poultry production practices, such as the use of antibiotics and overcrowding of birds, can increase the risk of Salmonella contamination.
Aloe vera can survive under a wide variety of conditions and has been shown to have many medicinal and antibiotic properties (Kar and Bera, 2018). Yadav (2017) reported that Aloe vera gel has been used for management of various infections since ancient times as it has anti-inflammatory, anti-microbial, and immune-boosting properties. The use of natural product such as aloe vera will be employed during outbreak of foodborne illness emanating from consumption of tainted chicken meat and eggs, which is a typical way to contract salmonella. The results of these studies will provide valuable information for rural and urban poultry producer, feed manufacturers, and public health officials on the efficacious level of Aloe Vera extracts in reducing Salmonella infection in poultry. Consequently, more flourishing market for chicken products and improved income for rural farmers, large scale farmers and the world poultry farmers.
The objective of the study was to determine the effect of Aloe Vera extract on growth traits of three chicken genotypes (broiler birds, layers, and local inbred chicken) challenged with Salmonella infection.

MATERIALS AND METHODS
Location of the Experiment
This study was conducted at the poultry unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka.

Preparation of Aloe Vera Gel Extract (AVGE)

Fresh aloe vera leaves were collected from Ogige market, in Nsukka, Enugu State. The leaves were washed with clean water to remove dirt. Aloe vera gel was extracted manually from leaves by making a cut on the leaves with a pocket knife. The gel was scooped out with a small spoon and drained into a beaker. The extract was prepared by pouring 400ml (0.4litre) of fresh gel into a glass bottle containing 40ml of clean tap water. The bottle was agitated for about 2 minutes to ensure thorough mixing, after which it was kept for 30 min at room temperature prior to use. The homogenized aloe vera gel extract (AVGE) was prepared at the interval of two (2) days and served to the animals fresh according to the treatments.

***Salmonella Typhumurium* strain**

A standard strain of Salmonella typhumurium used was received from the Veterinary Teaching Hospital in UNN. The chicks received a challenged of lower dose (10^6 CFU) of salmonella typhumurium by oral gauge (2mL) at four weeks of age.

Confirmation of the infection

To confirm the infection, fecal swabs were collected 24 hours post infection (d.p.i). The culture plates were incubated for 48h at 37℃.

Experimental Procedure

A total of six hundred birds; 3 genotype birds, broilers, local birds and in bred chicken were randomly assigned to four treatment groups for each genotype. The treatments were as follows, in every 1.5 litre of water: T1 = (not infected and untreated); T2 = (infected and treated with 10mls AVGE); T3 = (infected and treated with 15mls AVGE); T4 = (infected and treated with standard drug). Treatment 1 served as the control while T4 was standard drug for treatment of salmonella as positive control. All the groups were fed the same commercial broiler starter and finisher diet. Routine management practices in terms of medication and vaccination were strictly observed. The test material which was AVGE was added in the drinking water according to the treatments and served ad libitum to the bird. The chickens were observed for 6 weeks, and their growth and health will be monitored regularly. Body weight and feed intake were recoreded

Statistical Analysis

The data obtained was subjected to Analysis of Variance (ANOVA) in a Completely Randomized Design (CRD) using statistical package (SPSS, version 20) the significant difference in means was separated using Duncan's New Multiple Range Text (Duncan, 1955). The experimental model used is as follows: $X_{ijk} = \mu + T_i + G_i + TG_{ij} + \sum_{ijk}$

RESULTS AND DISCUSSION

Table 1 shows significant differences ($P<0.05$) in body weight from week 1, 2, and 4, the body weight of broilers varied from 24.06g for local to 35.56g; 27.27g for local to 60.70g for inbred; 49.53g for local chickens to 95.90g for broiler; 95.90 for local chickens to 212.52g for broiler and 125.85g for local chickens to 483.00g for broiler respectively. The body weights of the broiler was significantly ($p<0.05$) higher at weeks 0, 1 and 4, but statistically ($p>0.05$) similar at weeks 2 and 3 with the inbred. The body weight of broilers and inbred chicken at weeks 1 to 4 were significantly ($P> 0.01$) higher than local chicken. The increasing trend in body weight underscores the significance of age as a crucial determinant of growth and physiological development. The body weight of local chicken in the experiment at week 4 (125.85g) was in line with value (0.120kg) as recorded by Ohagenyi *et al.* (2021) and was close to the value (139g) reported by Momoh *et al*. (2008). Body weight of broilers at weeks 3(212.52g) and 4 (483g) were significantly lower than the values (724.41g) and (1134g) respectively as recorded by Mehala *et al.* (2008).

The similar performance among the broiler and inbred indicates increase homogeneity for growth genes among the inbred and further authentication of the predictive accuracy of the on-going breeding program on the inbred chicken. This result reveals competing growth between the inbred and broiler at the early ages (0 to 3). It equally implies that adequate feeding of the inbred chicken within the first 3 weeks of age would help in optimal expression of their growth performance and enhance the genetic improvement of the inbred chicken. Hence breeders should provide the best environment (feeding and management) for the selected inbred chicken for optimal expression of their traits.

Table 1: Descriptive Statistics on the effect of genotype on growth performance of three chicken genotypes, broilers, local chicken and in-bred chicken at starter phase (0 – 4 weeks)

Parameter	Week	Broiler	Local Chicken	inbred chicken	±SEM	P. Value	R-squared
Bw(g)	0	35.56^a	24.06^c	28.35^b	0.001	0.003	0.790
	1	47.50^b	27.27^c	60.70^a	0.019	0.000	0.914
	2	95.90^a	49.53^b	89.44^a	0.047	0.000	0.792
	3	212.52^a	95.55^b	207.67^a	0.670	0.000	0.832
	4	483.00^a	125.85^c	382.08^b	0.109	0.000	0.988

^{abcd}; mean on the same row with different subscripts are significantly different (P≤0.05 or P≤0.01). BW; Body weight, SEM: Standard error of the mean.

The findings show significant differences in body weight across the three genotypes at different weeks. Notably, broiler chickens exhibited higher body weights compared to inbred and local chickens. This discrepancy can be attributed to genetic variations that have led to the broiler birds' enhanced growth rate due to selective breeding for rapid growth performance. The increasing trend in body weight over weeks emphasizes the role of age as a key factor influencing growth and physiological development. This aligns with existing knowledge that body weight tends to increase as animals mature (Momoh *et al.*, 2008). Overall, the results underscore the importance of genetic makeup and age in determining body weight differences among these chicken genotypes. The study revealed that genetic improvements in broiler birds have indeed led to their superior growth performance, while mild selection among the inbred chicken brought about the superiority of the inbred chicken over the local chicken. However, further research would be needed to purify the growth performance of the inbred chicken.

Table 2: Duncan's means and standard error for Body weights and feed intake of 3 chicken genotypes treated with levels of Aloe Vera gel against salmonella at finisher phase. (5 – 8 weeks)

Parameters	week	Broiler	Local Chicken	inbred chicken	±SEM	P. Value	R-squared
BW(g)	5	698.80^a	167.80^b		25.40	0.015	0.883
	6	926.10^a	209.45^b		28.31	0.000	0.914
	7	1284.75^a	280.55^b		46.56	0.000	0.885
	8	1387.95^a	310.85^c	777.92^b		0.000	0.889
AWFI(g)	6	908.78^a	441.5^b	442.70^b	1.58	0.000	1.000
	7	921.15^a	468.5^b	471.70^b	1.87	0.000	1.000

Legend: ^{abcd}; mean on the same row with different subscripts are significantly different (P≤0.05 or P≤0.01). BW; Body weight, SEM: Standard error of the mean, AWFI; Average weekly feed intake

The table 2 above shows the body weight of 3 genotype chickens at weeks 5, 6, 7 and 8. The body weights at weeks 5,6,7 and 8 ranged from 167.80g in local chicken to 698.80g in broiler; 209.45g in local chicken to 926.10g in broiler; 280.55g in local chicken to 1284.75g in broiler; and 310.85g in local chicken to 1387.95g in broiler, respectively. The average weekly feed intake at 6 and 7 weeks of age ranged from 441.5g in local chicken to 908.78g in broiler birds and 468.5 in local chicken to 921.15g.

The results of body weight of local chicken at week 8 (310.85g) was higher than the value (301.80g) reported by Binda *et al.* (2012). The result of body weight of heavy ecotype at week 8 with the value (777.92g) was higher than the value (350g) reported by Momoh *et al.* (2010). The results of the experiment revealed significant differences in growth traits among the chicken genotypes fed Aloe vera extract levels. The broiler chicken was significantly (p<0.05) higher than the inbred, which performed significantly (p<0.05) better than the local chicken. In terms of body weight, broilers exhibited the highest values across all treatment groups, followed by inbred chickens and then local chicken. Regarding feed intake, broilers was significantly (p<0.01) higher in feed consumption at 6 and 8 weeks of age compared to local chicken and inbred local chickens, which were statistically similar. This disparity of feed intake between broilers and inbred chickens could be attributed to the genetic enhancements in broilers that lead to increased growth rates and greater feed consumption.

The differences in feed intake between inbred chicken and broilers, despite the extract supplementation, suggests that the genetic makeup of broilers might predispose them to higher feed consumption.

TABLE 3: Interaction effect between genotype and aloe vera on growth performance

GENOTYPE * ALOE VERA	TRAITS	WEEKS	INTERACTION
	BW	5	0.026*
		6	0.019*
		7	0.145
		8	0.007*

The interaction effects of genotype and aloe vera on growth performance are shown in table 3. The result showed that positive interaction existed between both factors at all ages except weeks 7. This finding highlights the complex interplay between genetics, treatments, and supplementation in shaping the growth and feed intake of different chicken genotypes. The results underscore the genetic improvements in broilers that contribute to their growth advantages. The positive response of broilers and inbred chickens to Aloe vera extract supplementation offers potential avenues for further research into natural growth enhancers. The findings provide valuable insights for poultry production practices and genetic selection strategies.

CONCLUSION

It was conclude that crossing local to exotic can improve body weights while aloe vera can help combat salmonella infection in growing birds.

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