Proc. 42nd Ann. Conf. Nigerian Society for Animal Production 26 – 30th March 2017, Landmark University, Omu-Aran.

EFFECT OF AQUEOUS GINGER EXTRACT (*Zingiber officinale*) On Growth Performance And Nutrient Digestibility Of Broiler Chickens Aged 28 Days

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ABSTRACT

A study was carried out using two hundred and forty (240) day old Marshal Broiler chicks to determine the effect of aqueous ginger extract on growth performance and nutrient digestibility. The chicks were randomly allocated to six treatments consisting of four replicate with ten birds per replicates in a completely randomized design (CRD). The aqueous extract of ginger (AEG) was obtained by infusing 14 g of ground ginger into 1 litre of boiled hot water and left for 12 hours; thereafter muslin cloth was used to filter extract from residue. The treatments were 0, 25, 50, 75, 100 and 125 ml of AEG per litre of water and were tagged $AEG_{0\ ml/L}$ $AEG_{25\ ml/L}$, $AEG_{50\ ml/L}$, $AEG_{75\ ml/L}$, $AEG_{100\ ml/L}$, and $AEG_{125\ ml/L}$, respectively. The treatments were administered to the birds every morning daily via drinking water. The experiment lasted for 28 days. Data obtained on growth performance and nutrient digestibility were analyzed by one way analysis of variance. Duncan's multiple range test of the same package was used to separate the treatments means where differences existed. The results of final weight, daily weight gain, total feed consumed and daily feed consumed were influenced ($P<0.05$) by AEG but initial live weight and feed conversion ratio were not influenced ($P>0.05$) by the treatments. Birds on AEG performed better ($P<0.05$) than control. Ash digestibility of the birds on AEG was enhanced ($P<0.05$). However, CP, NFE, CF, EE and DM were not influenced ($P>0.05$) by AEG. It was concluded that weight gain, feed consumed and ash digestibility of broiler chickens treated with AEG were positively influenced. Based on the results of the study, it is recommended that poultry farmers should to use aqueous extract of ginger up to 25 ml/l in the drinking water of broiler chickens as natural growth promoter for optimal performance of the birds. Further study should be carried out on the effect of AEG on haematological and serum biochemistry of broiler chickens.

Keywords: Ginger aqueous extract, growth performance and nutrient digestibility.

INTRODUCTION

The animal protein consumption of the vast population of developing nations across the world is inadequate (George *et al.*, 2013). Nigeria's dietary animal protein daily intake of 4.5 g falls short of the recommended 35 g per person/day (FAO, 2001). However, poultry production can proffer faster and cheaper means of arresting this menace in developing countries especially Africa (Kehinde *et al.*, 2011). To ensure more net return on poultry products and fewer expenses for feed, researchers have adopted many research strategies, by introducing feed supplements and feed additives (Joseph *et al.*, 2015). In the past, the basic growth promoters were antibiotics. Antibiotics improved growth performance in livestock but their side effects on public health has been global concern (Donoghue, 2003). Also, the emergence of pathogenic bacteria resistance to antibiotic, this has led to international prohibition against the usage of some synthetic antibiotics in the diets of animals (Joseph *et al.*, 2015).This has necessitated research into an alternative natural source of antibiotic. This partly stimulated this research. Spice and herbs are mostly used as natural growth enhancer in the diets of poultry chickens. Ginger spice, a natural growth promoter contains several compounds such as shogaols, gingerdione, gingerol, phenolic and gingerdiol (Zhao *et al.*, 2011). Al-Amin *et al.* (2006) reported that these ginger compounds had pharmacological effect on broiler chickens health. Furthermore, research findings indicated that the roles of this spice in promoting weight gain, meat yield, anti-cholesteremic, immunomodulating and anti-imflammatory effects on broiler chickens, lies in chemical constituents of ginger rhizome (Hanieh *et al.*, 2010 and Aji *et al.*, 2011). Joseph *et al.* (2015) noted that ginger extract inclusion level up to 50

ml/L enhanced growth performance in broiler chickens. Their result showed a linear increment in the chicken performance. However, there is no available study beyond this level. Thus, this study is designated to determine the effects of higher dosage of aqueous ginger extract on the growth performance and nutrient digestibility of broiler chickens.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at the Poultry Unit of Bache Farm, Minna, Niger State, Nigeria. Minna is situated between latitude 9° 28 North to 9° 37 North and longitude 6° 23 East and 6° 33 East with annual rainfall of 1000 – 1500 mm and average temperature of 32 °C. Minna is located in the Southern Guinea Savannah Vegetation Zone (Niger State ADP, 2009). Fresh ginger rhizome (root) was purchased from Kure Modern Market Minna. Niger State, Nigeria. The broiler chicks were obtained from Arewa farm, Zaria, Kaduna State. The commercial hybrid feed was used.

Fresh ginger rhizomes were thoroughly washed, peeled, cut into chips, air dried at room temperature of 23.1 °C during rainy season for sixty- one days to a moisture content of about 3.58 % and ground with hammer mill of 2 mm diameter into coarse powder and stored in air tight polythene until ready for usage. The aqueous extract of ginger was prepared by adding one litre of boiled hot water into 14 g of ground ginger in a container. The mixture was left to infuse and cool at room temperature for twelve hours. The extract was filtered using muslin cloth, and stored in a refrigerator at 4 °C. The extract was administered orally to the chicks via drinking water every morning at various concentrations. The extraction of aqueous extract of ginger was carried out weekly according to the method of Joseph (2015).

Experimental design

A total of two hundred and forty (240) day old Marshal strain of broiler chicks were randomly allocated to six treatments of 0, 25, 50, 75, 100 and 125 ml/litre of water and were tagged AEG_0, AEG_{25}, AEG_{50}, AEG_{75}, AEG_{100} and AEG_{125} treatments respectively. Each treatment was replicated four times with ten birds per replicate in a completely randomized design (CRD). Thus, 24 floor spaces were used.

Growth performance

The parameters that were measured on growth performance indices include live weight and feed intake. Feed consumed was calculated by finding the differences between the served and leftover feed quantities. Live body weight change was determined weekly, weight gain was determined by subtracting the previous week weight of the birds from the current week weight for each replicate. Feed conversion ratio calculated by dividing the quantity of feed consumed by average weight change.

Nutrient digestibility

This was conducted between 21 and 28 days of the experiment. Two birds were chosen at random from each replicate and transferred to specially constructed metabolism cages. They were allowed four days acclimatization, thereafter, fasted overnight and the feed and water was served *ad-libitum* to the broiler chickens. AEG and water mixture at various concentrations of 0 ml, 25 ml, 50 ml, 75 ml, 100 ml and 125 ml/litre of water were supplied every morning to the chickens for three day. Their droppings were collected and oven dried daily. Proximate composition of the feed and droppings were analyzed. The nutrients digestibility was determined using the formula below.

$$\text{Nutrient digestibility (\%)} \frac{\text{Nutrient consumed} - \text{nutrient in droppings}}{\text{Nutrients consumed}} \times 100$$

Chemical analysis

The proximate composition of aqueous ginger extract, feed and droppings were determined in line with the method of AOAC (2003). The determined chemical composition of the feed and droppings were used to analyze apparent nutrients digestibility of the broiler chickens served aqueous ginger extract.

Statistical analysis

Data obtained on growth performance and nutrient digestibility were analyzed by one way analysis of variance (ANOVA) using SAS (2014) version 9.3. Duncan's multiple range test of the same package was used to separate the treatments means where differences existed at $P<0.05$.

RESULTS

Results of the effect of aqueous extract of ginger on growth performance of Marshal broiler chickens aged 28 days is presented in Table 1.

The results exhibited that AEG had positive effect ($P<0.05$) on final live weight, daily weight gain, total feed consumed and daily feed consumed. However, feed conversion ratio and initial live weight were not affected ($P>0.05$) by AEG. The results of the effect of Aqueous extract of ginger on apparent nutrient digestibility of Marshal broiler chickens aged 28 days is presented in Table 2. Results indicated that AEG had no effect ($P>0.05$) on crude fibre, ether extract, crude protein, dry matter and nitrogen free extract digestibility. However, ash content digestibility was affected ($P<0.05$) by AEG.

DISCUSSION

There were significant differences in all performance traits measured at both starter phase except initial live weight and feed conversion ratio of broiler chickens treated with AEG across the treatments. Chickens on AEG performed better than those on control. The results of the study exhibited that AEG had better effect on the growth performance of broiler chickens. The improvement may be due to stimulatory effect of ginger extract on digestive juices, micro flora and nutrients assimilation in digestive tract obtained with ginger incorporation in poultry diets. These findings are in agreement with the results of Ademola *et al.* (2009) who reported that inclusion of 2 % ginger meal in the broiler chickens diets enhanced their feed intake and weight gain. Similarly, Garcia *et al.* (2007) reported an increased weight change with broilers chickens fed 6 % and 2 % ration supplemented with ginger meal. However, these results contradict the work of Javed (2009) who observed that aqueous extract of ginger did not influenced the broiler chickens weight gain. The differences may be due to lower dosage of aqueous ginger extract used in their study. Crude protein, dry matter, crude fibre, ether extract and nitrogen free extract nutrient digestibility of broiler chickens were not significantly affected by AEG but ash digestibility was significantly influenced. The effect may be linked to phenolic compound of ginger extract which enhance digestion by stimulating the endogenous enzyme in the guts of broiler chickens (Wafaa *et al.*, 2012). Birds on AEG had better nutrients digestibility when compared to those on control. These results confirm the findings of Hernandez *et al.* (2004), who found that incorporation of garlic extract influenced Ash digestibility of broiler chickens.

CONCLUSION

The results obtained from this study showed that feed consumed and weight gain of broiler chickens treated with AEG was positively influenced. Findings of this study indicated that ash digestibility of boilers chickens administered AEG were significantly affected. Based on the results obtained from the study, it is recommended that Poultry farmers are encouraged to use AEG at 25 ml/l via drinking water for optimal performance at the starter phase. Further study should be carried out on the effect of AEG on serum biochemistry and haematological of broiler chickens.

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