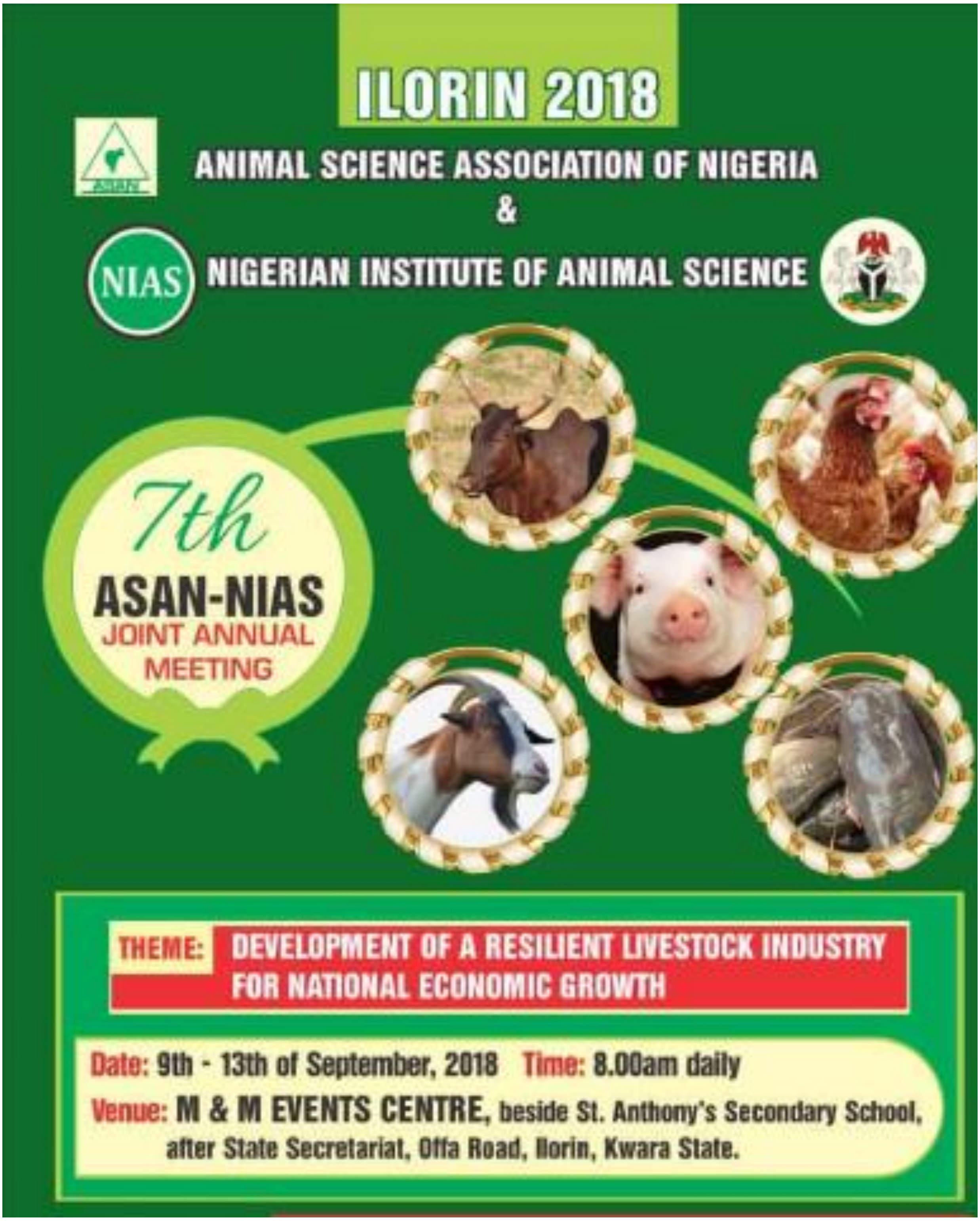

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Growth Performance and Nutrient Digestibility of Broiler Chicken Administered Aqueous *Moringa oleifera* Leaf Extract at The Finisher Phase

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Abstract: Growth performance and nutrient digestibility of Hubbard broiler chickens administered aqueous *Moringa oleifera* leaf extract (AMOLE) at the finisher phase was investigated. Aqueous *Moringa oleifera* leaf meal extract were included at 0- (ordinary water), 0+ (antibiotic in water), 60, 90, 120 and 150 mL per litre of water and tagged $AMOLE_{0-}$, $AMOLE_{0+}$, $AMOLE_{60}$, $AMOLE_{90}$, $AMOLE_{120}$ and $AMOLE_{150}$respectively. A total of 240-day old broiler chicks was allotted to the six treatments consisting of four replicates with ten birds per replicates using completely randomized design. They were fed *ad-libitum* for 6 weeks and data were collected on initial weight, growth rate, feed intake, final weight, water intake, feed conversion ratio and nutrient digestibility at the finisher phase. The results showed that there were no significant ($p<0.05$) differences in initial weight and water intake among the treatments. However, significant ($p>0.05$) differences were observed in the final weight, growth rate, feed intake and feed conversion ratio. Birds in the control group had the highest final weight (2392 g/bird), weight gain (49.78 g/bird) and better feed conversion ratio (1.93) than birds in the other treatments. The digestibility studies showed birds on AMOLE had better CP and EE digestibility. It was concluded that AMOLE can be included at 60 to 120 mL per litre of water to improve growth performance and nutrient digestibility of broiler chickens.

Keywords: Hubard broiler chicken, Aqueous *Moringa oleifera* leaf extracts (AMOLE), Growth performance, Nutrient Digestibility and Finisher phase

INTRODUCTION

Poultry meat is usually from spent layers and parent stock in the past, but recently cross breeding techniques has led to development of broilers (FAO, 1990). The main goal of broiler rearing is the production of quality carcass that will be acceptable by the consumer (FAO, 1990). The poultry industry has witnessed tremendous improvement from the past. These have been as a result of the discovery of vitamins and mineral additives, use of antibiotic growth promoters (AGP) and other growth hormones (FAO, 1990). The growth promoter effect of antibiotics was discovered in the 1940s, when it was observed that animals fed dried mycelia of *Streptomyces aureofaciens* containing chlortetracycline residues improved their growth (Castanon, 2007). These have enhanced gut health and controlled sub-clinical diseases. However, because of public concerns about bacterial resistance to antibiotics, the use of antibiotics and other synthetics have become limited or eliminated in many countries. European Union for example, banned the use of antibiotics as growth promoters since 1st January 2006 (Catalá-Gregori, *et al.*, 2008). Therefore, alternatives to AGP need to be proposed to livestock producers in order to maintain animal health, productivity and carcass quality.

Moringa oleifera is one of the promising plants with organic properties which could contribute to increased intake of some essential nutrients and health-promoting phyto chemicals (Balbir, 2006). *Moringa oleifera* contains active substances that can improve digestion and metabolism and possess bacterial and immuno stimulant activities (Ghazalah and Ali, 2008). It also contains bioceutical agents that could substitute synthetic growth enhancers and supplements in poultry birds (Lannaon, 2007). All parts of *Moringa oleifera* are edible and consumed by animals (Fuglie, 2001). However, there are limited studies on the use of aqueous *Moringa* *oleifera* leaf extract on the growth performance of broilers in poultry production in Nigeria. This study investigated the growth performance and nutrient digestibility of broiler chicken administered aqueous *Moringa oleifera* leaf extract at varying concentration at the finisher phase.

MATERIALS AND METHODS

The study was carried out at Abeezainab Integrated Farms, near Niger Baptist Schools Gidan Mangoro, along Minna-Bida Road, Minna, Niger State, Nigeria. Minna is located in the North Central Zone of Nigeria, it is found in the Southern Guinea Savanna Vegetation Zone and it lies between latitude 9°36' North and longitude 6°33' East. Minna has an ambient temperature range of 38 to 42° C. (Student Hand Book, 2014).Two hundred and forty Hubbard broiler chickens from *Bnot Harel* Hatchery in Ibadan, Oyo State, Nigeria was used for this study.

Moringa oleifera leave were purchased from Minna Central Market. The plant materials were air-dried at room temperature for five days and then ground into fine powder using a hammer mill grinding machine and stored for later use. The ground *Moringa* leaves was soaked in water for 24 hours at 60 g per litre of water. After that, the soaked *Moringa* leaves were filtered using a muslin cloth of 2 mm. The filtrate was used for the Treatments at different concentration while the residues were discarded according to the procedure of (Rathi *et al.*, 2006). A total of 240-day old birds were randomly allotted to six treatment levels of aqueous *Moringa oleifera* leaf extract in a Completely Randomized Design (CRD) (Table 1). The six treatments were replicated four times with ten birds per replicate. The birds were housed in deep litter system where they received uniform care and management for the eight weeks duration of experiment. Birds on each Treatment were fed *ad-libitum*. Water was provided for 20 hours and later deprived of water for four hours before the administration of the extract.

Table 1: Inclusion level of aqueous *Moringa oleifera* leaf meal extract per liter of water

Treatments	Inclusion level
$AMOLE_{0+}$	Positive control (ordinary water)
$AMOLE_{0-}$	Negative control (Antibodies at 1.25 g/L)
$AMOLE_{60}$	60 mL/L
$AMOLE_{90}$	90 mL/L
$AMOLE_{120}$	120 mL/L
$AMOLE_{150}$	150 mL/L

The parameters measured were growth performance and nutrient digestibility and data were collected on feed intake, water intake, live weight changes, feed conversion ratio, mortality, nutrients digestibility and final weight. The proximate composition of *Moringa oleifera,* feed and the collected faecal droppings were analysed based on the procedure of AOAC (2012). All data collected were subjected to one way analysis of variance (ANOVA) of completely randomized design, using statistical analysis system (SAS, 2012). Where differences occured at P<0.05, they were separated using Duncan Multiple Range Test (SAS, 2012).

RESULTS AND DISCUSSIONS

The results of proximate analysis of *Moringa oleifera* leaf showed that it had protein (23.80%) and crude fibre (16.57%) which was similar to the findings of Mabruk *et al.* (2010) and Zaku *et al.* (2015). The dry matter (94.47%) and ash (9.75%) contents were similar to those obtained by Mabruk *et al.* (2010) and Ogbe *et al.* (2013); the fat contents (5.50%) and nitrogen free extract contents (38.82%) were also similar to those reported by Mabruk *et al.* (2010) and Zaku *et al.* (2015).

The results indicate that the birds in the control treatment had the highest final weight. Furthermore, the final weight of birds on the AMOLE treatments increased until $AMOLE_{120}$ and later declined, this implies that the effective dosage must have been reached at about 120 mL. This result was in contrast to the previous report that *Moringa oleifera* inclusion levels resulted in higher final weights than the control (Chongwe, 2011; Portugaliza and Fernandez, 2012; Nkakwana *et al*. 2014). The reason for the disagreement may be due to the fact that they did not use aqueous *Moringa oleifera*.

The results of the present study also showed that birds on the control group had the highest growth rate compared to birds on the AMOLE Treatments; the growth rate showed a pattern similar to final weight which increased as inclusion level increases until $AMOLE_{120}$ and then decreased. This result agrees with the findings of (Nkukwana *et al*. 2014, but disagrees with reports of Olugbemi *et al*. 2010, Juniar *et al*. 2008 and Tesfaye *et al*. 2012). The reason for the conflicting result may be as a result of the different forms in which the *Moringa* was administered.

The results showed that Birds on $AMOLE_{90}$ had least feed intake while the others are similar to the control group. The AMOLE Treatments had significant influence on feed consumed as the difference between treatments are significant. This disagrees with the literatures, (Chongwe, 2011, Olugbemi *et al*. 2010; Juniar *et al*. 2008 and Paguia *et al*., 2012).

The results also show that birds in the control groups were better converters of feed than some of the AMOLE treatments. $AMOLE_{90}$ had best feed conversion ratio than $AMOLE_{150}$. Thisis similar to reports of (David *et al*. 2012; Portugaliza and Fernandez 2012 and Nkukwana *et al*. 2014).

The digestibility results show that there were significant ($p<0.05$) differences in the values obtained for DM, CP, CF, FAT, ASH and NFE between treatments and control groups. This revealed that the birds on AMOLE efficiently utilized the Nutrients than the control groups. This result does not agree with the findings of (Nkukwana *et al.* 2014). This could be due to the form in which the *Moringa* was administered.

Table 2: The proximate composition of *Moringaoleifera*leaf meal

Nutrients analyzed	Composition (%)
Dry Matter	**94.47**
Crude Protein	**23.80**
Crude Fibre	**16.57**
Fat	**5.50**
Ash	**9.75**
N.F.E	**38.85**

Table 3: Growth performance of broiler chicken administered aqueous *Moringa oleifera*leaf extract

Parameter	$AMOLE_{0-}$	$AMOLE_{0+}$	$AMOLE_{60}$	$AMOLE_{90}$	$AMOLE_{120}$	$AMOLE_{150}$	SEM	
I.W. (g)	1348.47	1304.72	1304.72	1264.72	1387.85	1332.78	21.25	
G.R. (g)	49.68^{a}	49.76^{a}	42.29^{a}	46.52^{a}	46.61^{a}	33.76^{b}	1.48	*
F.W. (g)	2392^{a}	2350^{c}	2200^{e}	2242^{d}	2367^{b}	2042^{f}	25.28	*
F.I. (g)	100.85^{bc}	95.48^{b}	102.55^{c}	90.00^{a}	100.65^{bc}	99.68^{bc}	1.72	*
W.I. (mL)	497.2	495.9	445.7	456.1	484.2	760.7	49.83	
FCR	2.05^{ab}	1.93^{a}	2.47^{b}	2.00^{ab}	$2.18a^{b}$	2.96^{c}	0.10	*

a, b, c- means with different superscript along the row differs significantly (p,0.05). I.W= Initial Weight, G.R= Growth Rate, F.W= Final Weight, F.I= Feed Intake, W.I= Water Intake, FCR = feed conversion ratio, SEM= Standard Error of Mean, LS= Level of Significance, *= Significant ($p<0.05$)

Table 4: Nutrient digestibility of broiler chicken administered AMOLE at the finisher phase

Parameter	$AMOLE_{0-}$	$AMOLE_{0+}$	$AMOLE_{60}$	$AMOLE_{90}$	$AMOLE_{120}$	$AMOLE_{150}$	SEM	
D M	81.63^{e}	86.86^{c}	86.98^{b}	79.94^{f}	86.14^{d}	88.82^{a}	0.77	*
C P	80.63^{e}	88.89^{b}	93.54^{a}	76.09^{f}	82.20^{d}	84.39^{c}	1.37	*
C F	99.10^{b}	99.17^{a}	99.13^{b}	99.00^{c}	99.11^{b}	99.12^{b}	0.01	*
E E	99.72^{d}	99.64^{e}	99.89^{a}	99.75^{c}	99.83^{b}	99.43^{f}	0.04	*
ASH	53.00^{f}	68.50^{b}	66.93^{c}	55.63^{e}	66.39^{d}	71.90^{a}	1.68	*
N F E	17.63^{b}	12.41^{d}	12.25^{e}	19.25^{a}	13.08^{c}	10.40^{f}	0.77	*

a, b, c- means with different superscript along the row differs significantly (p,0.05). C P= crude protein, C F= crude fibre, D M= dry matter, N F E= nitrogen free extracts E E Ether Extract

CONCLUSION

1. The results of the growth performance studies on Hubbard broiler chickens administered aqueous *Moringa oleifera* leaf extracts at the finisher phase shows that growth rate, feed intake, final weight and feed conversion ratio were influenced by AMOLE treatment.
2. Nutrients digestibility were influenced by AMOLE Treatments. It could be concluded that aqueous *Moringaoleifera* leaf meal extract can be included up to 120 mL in broilers drinking water to improve growth rate, feed conversion ratio, feed intake and final weight and up to 60 mL to improve nutrient digestibility of the chickens.

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