GASTROINTESTINAL TRACT AND INTERNAL ORGAN WEIGHTS OF BROILER CHICKENS OFFERED ADDITIVES PRODUCED FROM *ASPILIA AFRICANA* LEAF EXTRACTS

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ABSTRACT
The effect of additives produced from Aspilia africana leaves using different extraction methods on the seventh day gastrointestinal tract components and internal organ weightof broiler chicken was studied. Fresh Aspilia africana leaves were washed in water, shade dried for 48 hours and thereafter, macerated. Extraction of Aspilia africanaleaveswas performed using six methods; water decoction, methanol, and ethanol extraction, followed by microwave assisted repeats of the three-extraction media. The additive production was completed by the addition of sodium benzoate as preservative and Aspartame® as sweetener to each extract. They were labeled Aspilia africana water decoct (AAWD); Aspilia africana microwave assisted water decoct (AMWD); Aspilia africana ethanol extract (AAEE); Aspilia africana microwave assisted ethanol extract (AMEE); Aspilia africana methanol extract (AAME); Aspilia africana microwave assisted methanol extract (AMME). One hundred and sixty eight 1-day-old broiler chicks were divided into 7 groups of 24 chicks each. Each group was replicated 4 times resulting to 6 chicks per replicate in a 2 x 3 factorial in a completely randomized design experiment. The seven additives (treatments) were randomly assigned to the groups as follows: T1 (control- no additive), T2 (AAWD), T3 (AMWD), T4 (AAEE), T5 (AAEE), T6 (AAME) and T7 (AMME). Each replicate in the experimental group received 2ml of the additive per litre of drinking water daily. Seventh day gastrointestinal tract and internal organ weight results showed that chicks on AAWD additive recorded similar (p>0.05) weight of cropand liver compared with others, and significantly (p<0.05) higher weight of gizzard and large intestine. However, there was a significant (p<0.05) difference in crop weight between the chicks in control and those on additives from other extraction media and method. It is probable that older birds might exhibit marked differences in their response to the additives.

INTRODUCTION

A well developed and healthy gut is an important factor for optimum growth of birds because when gutfunction and health is impaired, digestion and absorption of nutrients are affected; hence the health and performance of the birds will be affected (Buba and Shehu, 2018). Consequently, several non-therapeutic growth promoting additives such as enzymes, inorganic acids, probiotics, prebiotics, and phytogenic additives have been used to optimize gut functions (Nabizadeh, 2012; Ofongo *et al.,* 2016; Ndelekwute and Enyenihi, 2017). Additives are also added in poultry feeds to improve nutritive value of ingredients and enhance poultry performance by improving feed utilization and promoting growth (Onunkwo *et al.*, 2019). Compared with synthetic antibiotics or inorganic chemicals, these plant-derived products have been proven to be natural, less toxic, residue free and therefore thought to be ideal additives in feed production (Hashemi *et al.,* 2008).They have been shown to possess antimicrobial, antiviral, antioxidant, and many other biological activities (Ertas*et al* 2005; Cross *et al.,* 2007),further enhances digestibility and stimulate the secretion of endogenous digestive enzymes (Williams and Losa, 2001; Lee *et al.*, 2003). These nutritional and health traits have made phytogenic additives a promising group of growth promoters that are presently been tried in the animal feed industry. *Aspilia africana* which is abundant in compound bushes and farms in southeastern Nigeria and exploited locally as fodder for small ruminants (Okoli *et al.* 2003) contains high protein value which suggests its potential use as a feed ingredient in animal production (Oko, 2010). For broilers grown to 42 days, the first seven days represents almost 17% of the total growing cycle – making it a crucial period; therefore, the importance of the first seven days in the life of the broiler chick cannot be over-emphasised, as this week sets the foundation for the lifetime performance of the broiler. Stimulating feed and water consumption during their first seven days will maximise gut development and give chicks the best start. Furthermore, it is important to maintain a healthy gut through good diet and appropriate nutritional intervention. The objective of this study, therefore, was to determine the effect of additives produced from leave extracts of *Aspilia africana* using different methods on the seventh day gastrointestinal tract and internal organ weight of broiler chickens.

MATERIALS AND METHODS

Development of additives from *Aspilia africana* leaves

The harvested fresh leaves of *Aspilia africana* for this study was weighed and washed in water to remove sand and debris, shade dried for 48 hours to reduce the moisture content and then macerated using Mastercheff® blender (Model Mc-211). The macerated leaves were extracted in three media; water, methanol, and ethanol, each in non-microwave assisted and microwave assisted. After which 0.05g sodium benzoate and 20g Aspartame® were added to each of the extract as preservatives and sweetener and labelled *Aspilia africana* water decoct (AAWD); *Aspilia africana* microwave assisted water decoct (AMWD); *Aspilia africana* ethanol extract (AAEE); *Aspilia africana* microwave assisted ethanol extract (AMEE); *Aspilia africana* methanol extract (AAME); *Aspilia africana* microwave assisted methanol extract (AMME)

Experimental birds and management

One hundred and sixty-eight (168) 1-day-old, Abor Acres broiler chicks were used for this study. The chicks were divided into 7 groups of 24 chicks each on weight equalization basis. Each group was replicated 4 times resulting to 6 chicks per replicate. The 7 experimental groups were randomly assigned to the 7 treatments as described: T_1 (control- no additive), T_2 (AAWD), T_3 (AMWD), T_4 (AAEE), T_5 (AAEE), T_6 (AAME) and T_7 (AMME) in a 2 x 3 factorial arrangement of the completely randomized design (CRD) experiment. Each experimental group received 2ml of the additive per litre of water per day. Feed and water were offered *ad libitum.*composition of experimental starter diet is presented in table 1 below.

Table1: Composition of experimental starter broiler chicken diets

Ingredients	Starter (%)
Maize	50.00
Soya bean meal	30.00
Wheat offal	6.00
Palm kernel cake (PKC)	6.00
Fish meal	4.00
Bone meal	2.00
Oyster shell	1.00
Vitamin/Mineral premix*	0.25
Common salt	0.25
Lysine	0.25
Methionine	0.25
Total	**100.00**
Metabolisable Energy (Kcal/kg)	2873.45
Crude protein	23.00
Ether extract	3.68
Crude fibre	4.15
Lysine	1.60
Methionine	0.62
Calcium	1.60
Phosphorus	0.67

*Starter: To provide the following per kg feed vitamin A15,000iu, vitamin $D_3$13000iu, thiamine 2.0mg, riboflavin 6.0mg, pyridoxine 4.0mg, cobalamine 0.05mg, biotine 0.08mg, pantothemic acid 5.0mg, folic acid 0.5mg, choline chloride 0.05g, manganese 0.096g, zinc 0.06g. copper 0.006g, iodine 0.0014g, selenium 0.24g, cobalt 0.25g and antioxidant 0.125g

Determination of seventh day growth gastrointestinal tract and internal organ weight of broiler chicken

On the seventh day of life, one bird each whose body weight is closest to the mean was taken from each replicate was weighed and thereafter sacrificed to determine gastrointestinal tract (GIT) and internal organ weight using the methods described by Ohanaka (2016).

Statistical analysis

Means of data collected were subjected to analysis of variance (ANOVA). Duncan New Multiple Range Test (DNMRT) was used to separate the means where significant treatment effect existed using (R-core team, 2012)

RESULTS AND DISCUSSION

Table 2 shows that chicks on AAWD additive recorded similar ($p>0.05$) weight of crop and liver compared with others, and significantly ($p<0.05$) higher weight of gizzard and large intestine. This indicates that AAWD enhanced GIT development in the chicken. Chicks on the control had similar ($p>0.05$) gizzard weight with other groups. The crop and small intestinal value may indicate efforts by these birds to maximize the functions carried out by these organs which may include feed conditioning by the crop to suit the digestive environment of the GIT. The range of percentage weight of components of GIT tracts and internal organs in this study are 0.76% crop in AAEE additive to 9.08% small intestine in AAME additive.

Table 2:Gastrointestinal tract (GIT) and internal organ weight of broiler chicken offered additives produced from *Aspiliaafricana* leaves

Parameters (% live weight)	Control	AAWD	AMWD	AAEE	AMEE	AAM	AMME	SEM
Crop (empty)	1.42^{a}	1.05^{b}	0.97^{b}	0.76^{b}	0.81^{b}	0.75^{b}	1.20^{b}	0.08
Proventriculus	1.40^{a}	1.57^{a}	1.50^{ab}	1.46^{ab}	1.42^{ab}	0.98^{b}	1.41^{ab}	0.07
Gizzard	5.18^{ab}	5.40^{a}	4.17^{b}	4.00^{b}	4.22^{ab}	4.14^{b}	4.19^{b}	0.16
Small Intestine	8.16^{a}	8.08^{a}	8.46^{a}	8.51^{a}	8.04^{a}	9.08^{a}	7.72^{a}	0.27
Large Intestine	1.66^{ab}	1.79^{a}	1.81^{a}	1.45^{ab}	1.62^{ab}	1.70^{ab}	1.28^{b}	0.06
Liver	4.67^{a}	4.19^{a}	4.31^{a}	4.26^{a}	4.25^{a}	4.36^{a}	4.12^{a}	0.11

^{abc}Means within a row with different superscripts are significantly different ($p<0.05$)

Gastrointestinal tract and internal organ weight of broiler chicken offered additives produced by differentmedia from *Aspilia africana* leaves extract is presented in table 3. There was a significant ($p<0.05$) difference in crop weight between the chicks in control and those on additives from other extraction media. Although there were no significant differences ($p>0.05$) between chicks on the extraction media, chicks on water medium had a superior percentage crop weight than others. Other parameters examined except gizzard were significantly different ($p>0.05$) among groups.

These results are consistent with those observed by Hernández *et al* (2004), who did not find differences among the control and those containing antibiotic or mixtures of plant extracts for organ weight of broiler chicken at 42-days of age. The chicks on the control however, recorded the highest gizzard weight which was significantly higher ($p<0.05$) than those on additives with ethanol medium.

Table 3: Gastrointestinal tract and organ weight of broiler chicken offered additives produced by different media from *Aspilia africana* leaves

Parameters (% live weight)	Control	Water	Ethanol	Methanol	SEM
Crop (empty)	1.42^{a}	1.01^{b}	0.78^{b}	0.97^{b}	0.08
Proventriculus	1.40	1.54	1.44	1.20	0.07
Gizzard	5.18^{a}	4.78^{ab}	4.11^{b}	4.16^{ab}	0.16
Small Intestine	8.16	8.27	8.27	8.40	0.27
Large Intestine	1.66	1.80	1.53	1.49	0.06
Liver	4.67	4.25	4.26	4.25	0.11

[ab]Means within a row with different superscripts are significantly different ($p<0.05$)

Gastrointestinal trait and organ weight of broiler chicken offered additives Produced by different extraction methods from *Aspilia africana* leaves extract is presented in table 4. Crop weight of chick on the control was significantly ($p<0.05$) higher than those on microwave and non-microwave method of extraction. Chicks on additives produced by both extraction method produced similar ($p>0.05$) crop weight. Proventriculus, gizzard, small intestine, large intestine, and liver weights were similar ($p>0.05$) for chicks in both groups with non-microwave method producing superior values except for proventriculus.

Table 4:Gastrointestinal tract and organ weight of broiler chicken offered additives produced by different method from *Aspilia africana* leaves

Parameters (% live weight)	Control	Microwave method	Non-Microwave method	SEM
Crop (empty)	1.42[a]	0.99[b]	0.85[b]	0.08
Proventriculus	1.39	1.44	1.33	0.07
Gizzard	5.18	4.19	4.51	0.16
Small Intestine	8.16	8.06	8.55	0.27
Large Intestine	1.65	1.56	1.65	0.06
Liver weight	4.66	4.23	4.27	0.11

[ab]Means within a row with different superscripts are significantly different ($p<0.05$)

CONCLUSION

Following the results of this experiment, it had been demonstrated that additives produced from *Aspilia africana* leaves did have significantly improve the various components of gastrointestinal and organ weight of broiler chicks.

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