

EFFECTS OF *AMARANTHUS SPINOSUS* (GREEN) LEAF MEAL ON THE PERFORMANCE OF HUBBARD BROILER CHICKS

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Abstract: A twenty eight day feeding trial was conducted with one hundred and twenty 7-day old Hubbard 2000 broiler chicks to study the effects of green leaf (*Amaranthus spinosus*) as a dietary energy source. *Amaranthus spinosus* leaves dried and ground were used to each replace wheat offal in the following dietary levels: 0%, 2.5%, 5%, 7.5% and 10%, respectively. The chicks were divided into five treatment groups, each group replicated four times at the rate of five chicks per replicate. The performance and organ weight characteristics were evaluated. *Amaranthus spinosus* leaf meals improved the mean feed intake, body weight gain and live weight of broilers. The performance of broilers in the *Amaranthus spinosus* leaf meal based diets was inferior to the control. *Amaranthus spinosus* caused significant proportionate growth in % daily weight ($p < 0.05$) and carcass evaluation ($p < 0.05$). Utilization of *Amaranthus spinosus* significantly increased ($p < 0.05$) the % live weight of the abdominal fat thus improving the nutritive value of the meat. The aim of this research was to determine the response of *Amaranthus spinosus* leaf meal on the organ weight characteristics and performance of Hubbard starter broilers.

Key words: Hubbard broiler chicks; *Amaranthus spinosus*; leaf meal; wheat offal; performance; organ weight

ЕФЕКТИ НА БРАШНОТО ОД ЛИСТОТ (ЗЕЛЕН) НА *AMARANTHUS SPINOSUS* ВРЗ ПЕРФОРМАНСИТЕ НА БРОЈЛЕРСКИТЕ ПИЛИЊА ОД ХИБРИДОТ ХАБАРД

Апстракт: Заради проучување на ефектот на зелените листови на *Amaranthus spinosus* како диететски извор на енергија, изведено е дваесет и осум-дневно испитување врз 120 бројлерски пилиња од хибридоот хабард, стари 7 дена. Беа употребени исушени и сомелени листови од *Amaranthus spinosus* како замена за пченичните трици, со следните диететски нивоа: 0%, 2,5%, 5%, 7,5% и 10%. Пилињата беа поделени во пет групи, при што секоја група беше реплицирана четири пати, пет пилиња по репликат. Беа оценувани перформансите и тежината на органите. Крмното брашно од листови на *Amaranthus spinosus* го подобри просечниот внес на храната, порастот на телесната тежина и живата мера на бројлерите. Перформансите на бројлерите кои беа на исхрана базирана врз крмно брашно од листови на *Amaranthus spinosus* беа инфериорни во однос на контролата. *Amaranthus spinosus* предизвика значителен пропорционален пораст во % дневна тежина ($p < 0,05$) и оцената на трупот ($p < 0,05$). Утилизацијата на *Amaranthus spinosus* значително го зголеми ($p < 0,05$) процентот на живата тежина на абдоминалната маснотија, на тој начин подобрувајќи ја хранливата вредност на месото. Целта на ова истражување беше да се утврди ефектот на крмното брашно од листови на *Amaranthus spinosus* врз тежината на органите и перформансите на бројлерите од хибридоот Hubbard.

Клучни зборови: бројлерски пилиња хабард; крмно брашно од листови на *Amaranthus spinosus*; пченични трици; перформанси; тежина на органите

INTRODUCTION

In poultry production, feed cost claims the largest share of the total expenses involved in the production process. Feed alone accounts for over

75% of the total cost of production, out of which 50% is expended on protein and energy sources (Ahaotu *et al.*, 2013a, 2016a and b). An approach that seems to have the greatest potential products is

the evaluation of the alternative feed sources including *Amaranthus spinosus*. It was felt that *Amaranthus spinosus* could be an untapped energy source that can substitute wheat offal, which is currently the plague and limiting factor in the expansion of poultry and poultry feed industry. The utilization and incorporation of *Amaranthus spinosus* into broiler feed will go a long way in increasing broiler production, conserve the Nations Foreign exchange used in importation of cereals and finally reduce the pressure on the major energy source in broiler rations.

Several factors have been generally identified as limiting to the utilization or high incorporation of non-conventional feedstuffs in livestock feed. These include low protein content, high fibre, amino acid imbalance and presence of anti-nutritional factors (Ahaotu *et al.*, 2018a and b). Anti-nutritional factors have significant negative effects on livestock production. These effects include reduction in palatability, digestibility and utilization of ration, intoxication of different classes of livestock, resulting in mortality or decreased production of animal and reduction in the quality of meat, egg, and milk products due to the presence of hazardous residues (Akinfemi *et al.*, 2014; Ononiwu *et al.*, 2017; Ahaotu *et al.*, 2017). Alternative sources of feed ingredients should be found which are not utilized by the human population and which, at present, might not have been found wider use in animal feeding (Ahaotu *et al.*, 2015; Okonkwo and Ahaotu, 2014).

MATERIALS AND METHODS

The study was carried at the Teaching and Research Farm (Poultry Unit) of the Department of Animal Production and Health Technology, Imo State Polytechnic, Umuagwo, Ohaji, Nigeria. The site is situated between longitudes 7° 0' 06" and 7° 03' 00" E and latitudes 5° 28' 00" and 5° 30' 00" N in the humid tropical West Africa (IMLS, 2009).

ANIMALS, DIETS AND EXPERIMENTAL DESIGN

A total of one hundred and twenty (120) seven days old Hubbard 2000 broiler chicks were randomly allotted to five experimental treatments in a completely randomized design. The chicks were divided into five treatment groups, each group replicated four times at the rate of five chicks per replicate. The experimental diets and water were provided *ad libitum* throughout the experimental period

that lasted for four weeks. Prior to the beginning of the experiments, birds were weighed to obtain their initial body weight and subsequently on a weekly basis. The performance parameters measured were feed intake, body weight gain and feed conversion ratio.

Table 1

Chemical composition of the experimental diet

Ingredients	T ₁	T ₂	T ₃	T ₄	T ₅
<i>Amaranthus spinosus</i>	0.00	2.5	5.0	7.5	10.0
Wheat offal	10.0	7.5	5.0	2.5	0.00
Fish meal	3.0	3.0	3.0	3.0	3.0
Groundnut cake	10.0	10.0	10.0	10.0	10.0
Soya-bean meal	22	22	22	22	22
Maize	40	40	40	40	40
Palm kernel cake	10.0	10.0	10.0	10.0	10.0
Bone meal	4.29	4.29	4.29	4.29	4.29
Lysine	0.1	0.1	0.1	0.1	0.1
DL-methionine	0.06	0.06	0.06	0.06	0.06
Premix (broiler)	0.25	0.25	0.25	0.25	0.25
Common salt	0.3	0.3	0.3	0.3	0.3
Total	100	100	100	100	100

Chemical composition nutrients					
Crude protein	23.20	22.50	21.80	21.10	20.40
Crude fiber	3.40	3.86	3.96	4.34	4.36
Ether extract	3.61	3.73	3.76	3.89	3.94
ME/kcal/kg)	2809.9	2805.9	2802.2	2798.5	2794.7

*2.5 kg Premix/tonne contain: Vitamin A 10,000 I.U.; Vitamin D₃ 2000,000 I.U., Vitamin E 12,000 I.U. Vitamin K 2.5 gm, Thiamine 1.5 g, Riboflavin 5 g, Pyriboflavin (B₆) 1.5 g, Vitamin B₁₂ 10 mg, Biotin 2 mg, Niacin 15 g, Pantothenic acid 5 g, Zinc 50 g, Iron 25 g, Copper 5 g, Iodine 1.4 g, Selenium 100 mg, Cobalt 300 mg, B. H. T. 125 g.

Carcass characteristics

At the end of the feeding trial, 3 birds from each replicate group were randomly taken; fasted over night and slaughtered by severing the jugular vein. The birds were dressed and eviscerated. During the evisceration, the internal organs and other parts were carefully removed and weighed. Their weights were expressed as a percentage of the dressed carcass weight.

Data analysis

Data analysis was done using analysis of variance technique of Steel and Torrie (1980) while significant differences in means were separated using the method of Duncan's Multiple Range Test as outlined by Gordon and Gordon (2004).

Management

Each experimental group was offered its corresponding diet *ad libitum* and they had free access to water. Hygienic conditions were followed to keep the drinkers and feeders always clean. Feeds offered were weighed. At the end of the week the residues were weighed and deduced from the introduced

amounts. The chickens were weighed weekly before being given food. All mortality cases were registered.

RESULTS AND DISCUSSION

Effect of *Amaranthus spinosus* leaf meal on the performance of Hubbard broiler chicks is presented in Table 2. There was significant ($p < 0.05$) variations in body weight gain and feed conversion ratio of the chicks. Inclusion of higher levels of *Amaranthus spinosus* leaf meal was accompanied by a significant ($p < 0.05$) improvement in final body weight and daily weight gain of Hubbard broiler chicks.

Table 2

Effects of *Amaranthus spinosus* leaf meal on performance of Hubbard broiler chicks

Parameters	T1	T2	T3	T4	T5	SEM
Initial body weight (g)	55	54.10	54.40	54.80	55.70	0.03 ^{ns}
Final body weight (g)	492.4 ^a	382.2 ^b	356.9 ^c	336.7 ^d	325.6 ^a	3.00*
Body weight gain (g)	34.57	31.28	30.85	30.20	28.50	2.98*
Daily weight gain (g)	25.84 ^a	28.15 ^b	29.39 ^b	31.55 ^c	34.32 ^d	0.29*
Daily feed intake (g)	48.21	49.71	50.96 ^a	53.03 ^a	58.26 ^b	3.65 ^{ns}
Feed conversion ratio	2.28 ^a	2.49 ^b	2.61 ^c	2.91 ^d	3.12 ^d	0.93*
Feed cost	201.16 ^e	195.6 ^d	184.48 ^c	178.92 ^b	171.44 ^a	2.17*

a, b, c, d, e means with different superscripts on same row differ significantly ($p < 0.05$).

* = significant ; ns = not significant

The observed improvement ($p < 0.05$) in weight gain of the broiler chicks fed T₄ might be due to the presence of supplementary wheat offal. Addition of 2.5% wheat offal and 7.5% *Amaranthus spinosus* leaf meal improve feed intake suggesting that was not the reason for the trend of feed intake. This agrees with the findings of Ahaotu *et al.* (2012), Uwalaka *et al.* (2013), Price (2008) and Berganza *et al.* (2003) that consumption of high fibre diets resulted in significant ($p < 0.05$) increase in feed intake. The result of the organ weight characteristics of the broiler chicks is shown in Table 3. The result showed that *Amaranthus spinosus* leaf meal and wheat offal had no significant ($p < 0.05$) effect on heart and kidney weights. This finding is in agreement with the reports of Ahaotu *et al.* (2013b), Bresnani *et al.* (1993) and Brenner *et al.* (2000). These

authors observed significant ($p < 0.05$) improvement in heart girth of broiler chicks with increased dietary energy density.

Table 3

Effects of *Amaranthus spinosus* leaf meal diets on organ weight characteristics of Hubbard broiler chicks.

Heart girth	9.86 ^a	9.53 ^b	9.52 ^b	10.80 ^b	11.80 ^c	1.90*
Liver	2.37	2.37	2.39	2.41	2.45	0.08 ^{ns}
Heart	0.60	0.59	0.68	0.70	0.72	.06 ^{ns}
Kidney	0.48	0.46	0.47	0.49	0.52	0.09 ^{ns}
Gizzard	3.38	3.39	3.37	3.59	4.01	0.03 ^{ns}

CONCLUSION

Amaranthus spinosus leaf meal and wheat offal supplementation in broiler chicks diets produce positive results in broiler chick production at 7.5% inclusion rate. It also enhances the productivity and feed conversion ratio of broiler chick rearing. For optimizing the profits from broiler production, *Amaranthus spinosus* leaf meal and offal may be incorporated to the diets of commercial starter broilers.

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