GROWTH RESPONSE OF BROILER FINISHERS FED GRADED LEVELS OF BITTER MELON (*Momordica charantia*) LEAF MEAL-BASED DIETS

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ABSTRACT
A total of 120 Anak broiler strain of 28 days old were used for the study. Four experimental diets were formulated such that the control treatment (T_0) had no Bitter melon leaf meal (BMLM), while treatments 1, 2 and 3 contained 2.5, 5.0 and 7.5% of BMLM replacing of soya bean meal. Thirty birds were assigned to each treatment group with three replicates in a complete randomized design and each replicates had 10 birds. The BMLM on analysis revealed the presence of Crude protein (29.62±1.30%), crude fibre (5.14±0.21%), crude fat (1.10±0.11%), nitrogen free extract (NFE) (35.83±0.30%) and ash (15.14±0.10%) as nutrients constituents. The data generated from the feeding trial showed that there were significant differences ($P<0.05$) across the various treatments: T_0, T_1, T_2 and T_3 in mean feed consumption and weight gain. The highest body weight of 2.40kg recorded from birds on T_2 (5.0% BMLM) show that the test ingredient can successfully be incorporated into broiler feed formulation to as high as 5% level replacement for soya bean meal, without any deleterious effect on biological productivity.
Keywords: Bitter melon leaf meal, Broiler, growth response.

INTRODUCTION
The use of leaf meal as against conventional feedstuff is gradually gaining insight in animal nutrition. Most leaf meals of some tropical legumes and browse plants have been shown to contain nutrients like proteins, vitamins and mineral (Andre-Meeusen, 2013). Their inclusion in the diets could help to reduce feed cost and minimize direct competition between man and the livestock industry for the available conventional feedstuffs. Bitter melon (*Momordica charantia)*, a member of the cucurbit family is a creeping plant and is widely distributed in West Africa, India and Japan (Taylor, 2005). It is commonly called bitter gourd, bitter melon, bitter cucumber, balsam pear, balsam apple and it is locally called *"Ebisikhuli"* in Esan, Edo State, Nigeria where this study was undertaken. The National Bitter Melon Council (2008) reported a nutritional value of 44kcal, 5.6g protein, 290mg calcium, 5mg iron, 5.1mg vitamin A, 170mg vitamin C per 100g serving. Medically, bitter melon is important to man and livestock, because of its ability to prevent and also treat diseases, such as diabetes in man (Taylor, 2005) gastrointestinal infection in broilers (Bakara *et al,* 2010). It can also stimulate milk let-down in cattle (National Bitter melon Council, 2008). It has been used to stimulate appetite in broilers in order to enhance their feed intake for proper growth and development (Wendy and David, 2002). It has been demonstrated to calm down high body temperature of broiler chicks during hot weather in other to reduce high mortality rate (Taylor, 2005). The nutritional value of bitter melon as highlighted by National Bitter Melon Council (2008) stimulated the interest of its incorporation as a cheap alternative to the conventional expensive protein source. In this study, *Momordica charantia* leaf meal is used as replacement for soya bean meal in raising broiler chicks from 5th week to 7th week, to determine actual feed consumption, weight gained and feed conversion ratio.

MATERIALS AND METHODS
Location and Duration of Study
The study was carried out at the Poultry Unit of the Teaching and Research Farm of Ambrose Alli University, Ekpoma, Nigeria for a period of seven weeks.

Sources and Processing of Bitter Melon Leaf Meal (BMLM)
The young bitter melon leaves at bloom (i.e. before flower production) were harvested from

the wild within the University campus and its environs. The plant material was sorted out to eliminate all extraneous materials. The leaves were air-dried to moisture level of 13.10% within 72 hours, while still retaining its green colouration. The dried leaves were then milled using a blending machine to produce bitter melon leaf meal (BMLM) to pass through a 2mm mesh sieve suitable for incorporation into broiler feed.

Experimental diets

Four experimental diets were formulated such that the control treatment (T_0) had no BMLM, while treatments 1,2, and 3 contained 2.5, 5.0 and 7.5% level of BMLM respectively in place of soya bean meal. The experimental finisher diets were formulated to contain 21% crude protein and were isocaloric (2750kcal/kg).

Experimental Birds, Design and Management

A total of 120 Anak boilers strain previously raised to 28 days on a standard broiler starter mash containing 23% crude protein and 2850kcal/kg ME were used for the study from the 5th till end of 7th weeks. Thirty birds were assigned to each treatment group with three replicates each in a complete randomized designed. Each replicate contain 10 birds. Experimental feed and clean water were supplied to the chicks *ad libitum*. Routine medication, vaccination and other management practices were strictly adhered to. During the feeding trial, feed consumption and weight changes of birds in each treatment group were recorded, while weight gain poultry efficiency ratio (PER) and feed conversion ratio (FCR) were estimated to measure growth performance..

Chemical analysis of BMLM

The proximate analyses of bitter melon meal used were determined according to the procedures of AOAC (1990)..

Statistical analysis

Data collected from the feeding trial were subjected to a one-way analysis of variance (ANOVA). Significant difference among treatment means were separated using Duncan's multiple range test as outlined by Steel and Torrie using SAS (2002) package.

RESULTS AND DISCUSSION

The results of the proximate analysis of the dried leaves of *M. charantia* (Table 2) showed low level of fibre and fat. The crude fat content value 1.10±0.11% was lower than the value reported for *Amarantus hybridus* (4.65%) (Akubugwo *et al.*, 2007). Value for crude fat from leaves of *M. charantia* by Bakare *et al* (2010) were also higher than value reported from this study. The study however also showed that the plant leaves contain small amount of fibre (5.14±0.21%) which could be beneficial when consumed by broilers as it is known to reduce the risk of gastrointestinal disorder (Saldanha, 1995). The leaf contained considerable amount of energy (carbohydrate) in the form of nitrogen free extract (NFE) (35.83±0.30%) and crude protein (29.62±1.3%), while the ash level was very moderate (15.14±0.11%). This analysis showed that the leaf of *M. charantia* is a good source of carbohydrate and protein, and may serve as source of energy and nutrient for the body metabolic activities and tissue built-up. The values reported for crude protein and carbohydrate (NFE) in this study were a little higher than earlier findings by Bakare *et al* (2010) who reported values of 27.46±1.60% and 32.34±0.024 respectively. The higher variation in values particularly for the protein in this study might be adduced to different soil type and age at harvesting the leaves. The total ash content of the leaves were higher compared to the values reported by Bakare *et al* (2010) for the fruit and seed of *M. charantia*. The value for ash content were however comparable to the values reported for some Nigerian leafy vegetables (Akindahunsi and Salawu, 2005). There was a significant level of difference ($P<0.05$) in feed consumption and mean weight gain for the various treatments. An obvious relationship of similarities existed between the control and the 2.5% - 5.0% BMLM level of replacement for soya bean meal in both daily feed consumption and weight gain traits were observed. However, *M. charantia* leaf meal significantly ($P<0.05$) decreased body weight of birds at 7.5% compared with the control diets without BMLM. This is in tandem with the reports of Farhat Bano *et al* (2011) who similarly observed significant decrease in body weight of rats. The reduction in weight at 7.5% level may be due to hypoglycemic agents in bitter melon (El Sattar, 2006) which increase the fatty oxidation due to inefficient glucose as source of energy (fuel) for metabolic activities of the birds. (Qixuan Chen *et al*, 2003). The bitter taste of BMLM as level increases also must have

affected palatability of broiler chicks to reduce their feed intake and eventual loss of weight gain. The performance of the birds in the study (Table 3) showed that there was significant differences (P>0.05) in PER, FCR and mortality record. It also means that there was adequate protein by protein replacement of BMLM in soya bean meal during formulation. Similarly, no significant difference (P>0.05) was reported in feed conversion ratio for the various treatments. However, for the FCR of the birds on the 7.5% BMLM treatment registered the least conversion values. The highest body weight of 2.40kg at the end of the study (7weeks) recorded from birds on treatment 5.0% BMLM (T_2) show that *M. charantia* leaf meal can be successfully incorporated into broiler finisher feed to replace soya bean meal to as high as 5.0% level.

CONCLUSION

The proximate analysis of BMLM suggest that *M. charantia* contains a good amount of protein nutrient that can be used in broiler finisher diets up to 5% level of inclusion. However, a higher level of BMLM seems to support feed intake with consequent drop in weight gain.

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Table 1: Gross Composition of Experimental finisher diets containing varying levels of BMLM.

Ingredients	Inclusion levels of BMLM (%)			
	0	2.5	5.0	7.5
	Treatments			
	T_0	T_1	T_2	T_3
Maize	54.72	54.84	54.90	54.16
Soya Bean meal	36.30	35.15	34.00	32.70
Wheat offal	3.40	1.88	0.36	0.04
BMLM	-	2.50	5.00	7.50
Red Palm oil	1.28	1.28	1.28	1.28
Bone meal	1.84	192	2.00	1.96
Limestone	1.91	1.88	1.85	1.81
Salt	0.30	0.30	0.30	0.30
Premix (finisher)	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated values:				
Crude protein	20.85	20.69	20.25	20.98
Metabolizable energy (kcal/kg)	2759	2734	2768	2748
Determined values:				
Moisture	14.61	15.30	13.52	14.28
Crude protein	21.25	21.20	21.00	20.95
Crude fibre	11.02	14.43	10.90	13.54
Crude fat	1.49	1.09	0.50	0.96
Ash	8.72	12.23	16.77	16.33

Table 2: Proximate Analysis of Bitter melon (*Momordica charantia*) meal

Parameter (%)	Leaf
Moisture	13.10 ± 1.12
Dry matter	86.90± 1.23
Crude protein	29.62±1.30
Crude fibre	5.14±0.21
Crude fat	1.10±0.11
NFE	35.83±0.30
Ash	15.14±0.10

Table 3: Growth performance traits of broiler finishers fed varying levels of BMLM

Parameters	Inclusion levels of BMLM (%)				
	0	2.5	5.0	7.5	
	Treatment				
	T_0	T_1	T_2	T_3	SEM±
Av. initial body weight (g)	645	650	650	650	0.01
Av. final body weight (g)	2380	2210	2400	2130	0.32
Av. daily feed intake (g)	152.22^{a}	149.00^{ab}	146.00^{ab}	143.18^{b}	0.02
Av. daily body weight (g)	41.51^{a}	38.11^{ab}	36.35^{ab}	34.51^{b}	0.02
Av. protein intake (g)	32.35	31.59	30.60	30.00	0.12
Feed conversion ratio (FCR)	3.67	3.91	4.01	4.15	0.13
Protein efficiency ratio (PER)	32.35	31.59	30.60	30.00	0.02
Mortality (%)	0.08	0.04	0.04	0.04	0.00

a,b means in the same row with varying superscript differ significantly (P<0.05)
SEM: Standard error of means