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Quails Response to Aqueous Extract of Bush Marigold (*Aspilia africana*) Leaf

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Abstract: Problem statement: The effects of inclusion of aqueous extract of Bush marigold (*Aspilia africana*) leaf in quail diet were investigated. One hundred and fifty Japanese quail chicks were used in the study. **Approach:** In the 14-weeks feeding experiment, the birds were assigned to five treatments of; 0, 2.5, 5.0, 7.5 and 10% inclusion of aqueous extract of Bush marigold leaf. Each treatment had 3 replicates of 10 birds per replicate in a randomized complete block design. **Results:** The results indicated that feeding Aqueous extract of Bush Marigold Leaf (AeBML) did not affect ($p>0.05$) daily weight gain, feed conversion ratio and carcass yield. Mortality and % cracked eggs were reduced ($p<0.01$). Feed intake and dressed weight of growing quails were significantly ($p>0.05$) affected by dietary supplementations with AeBML. Egg number and hen day production increased ($p<0.001$) as level of AeBML increased, though egg weight decreased ($p<0.01$). Feeding AeBML improved ($p<0.001$) albumen weight, shell thickness and yolk colour when compared to the control. **Conclusion:** The study concluded that dietary inclusion of up to 5% aqueous extract of bush marigold leaf in the diets of growing and laying quails could enhance growth performance and egg production traits.

Key words: Bush marigold, egg quality, growth promoter, Japanese quail, plant extract

INTRODUCTION

Innovative technologies for sustainable production of high quality animal products are the current research focus in the livestock industries of many countries (Levic *et al*., 2009; Al-Kirshi *et al*., 2010; Kostadinovic *et al*., 2010; Runjaic-Antic *et al*., 2010). Dietary manipulations involving nutritional, sensory, chemical, physical and physiological characteristics of feed materials are one of the strategies developed for improving the quality of animal products (Runjaic-Antic *et al*., 2010). Poultry meat and eggs offer considerable potentials for bridging the protein gap, because high yielding exotic poultry adapt easily to the tropical environment and the technology of production is relatively simple with returns on investment appreciably high (Ekenyem and Madubuike, 2006). The incessant rise in feed cost and the resultant shortage in animal protein supply have encouraged the exploitation of locally, available and cheap animal and feed resources to forestall threat to the future of poultry production (Runjaic-Antic *et al*., 2010; Obuzor and Ntui, 2011).

Quail farming as an alternative poultry enterprise has only recently been introduced into Nigeria, where it is reared for its excellent meat and egg characteristics due to its numerous nutritive and economic benefits (Odugbo, 2004). Quail meat and egg are renowned for their high quality protein, high biological value and low caloric content.

The suitability of a number of plant species in the sustainable production animal feed is being exploited CTA, 2006. Medicinal ingredients of plant origin have different chemical nature and show a very wide range of pharmacological effects such as antibacterial activity, anti-inflammatory, astringent, antidiarrhoeal, digestion-stimulating, laxative, sedative, spasmolytic and choleretic (Runjaic-Antic *et al*., 2010; Hashemi *et al*., 2008). Plants also have high amount of vitamins, minerals and contain pigments such as oxy-carotenoids, xanthophyllys useful for skin and egg pigmentations in birds (D'Mello and Acamovic, 1989). Plant materials such as herbs, spices, plant extracts, essential oils and meals are also receiving increased attention as possible natural alternatives to antibiotic growth promoter to boost monogastric performance (Al-Kirshi *et al*., 2010; Hashemi *et al*., 2008; Hernandez *et al*., 2004).

Several in-vitro studies have been conducted on bush marigold (*Aspilia africana-Astereaceae)* leaf as antimicrobial agents (Kuaite *et al*., 1999; Okoli *et al*., 2007). However, limited publish reports are available on the effect of bush marigold leaf meal or extracts as growth promoter in monogastric production. Therefore,

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the objective of this present study was to evaluate the effect of aqueous extract of bush marigold leaf meal on the productive and laying performance of quails.

MATERIALS AND METHODS

The experiment was conducted at the Poultry unit of the Teaching and Research Farm, Faculty of Agriculture, University of Calabar, Nigeria. Bush marigold was obtained by harvesting whole field plant above 3 cm stubble height within the mid vegetative to flowering stage of development as described. The leaves were sorted to remove any contaminants, dead matter and sand particles. They were air-dried for 96 h and the dried leaves were ground to fine powder to form bush marigold leaf meal using a hammer mill fitted with a 1mm screen. 100g of leaf meal was measured into a conical flask and soaked in 600 mL of distilled water for 48 hours at room temperature. The mixture was filtered into 250 mL conical flask with Whatman filter paper no.1. The filtrate was then concentrated *in vacuo* (40°C) to produce gel-like Aqueous extract of Bush Marigold Leaf (AeBML).

Basal (antibiotic-free) diets were formulated to meet the nutrient requirements of growing and laying quails (Table 1). 0, 2.5, 5, 7.5 and 10% Aqueous extract of Bush Marigold Leaf (AeBML) were supplemented into the basal diets. One hundred and fifty, 1-week old quail chicks were randomly assigned to each of the five experimental diets in a randomized complete block design. Each treatment had three replicates of 10 birds/replicate. Each replicate was housed in separate pen and maintained on their various test diets throughout the feeding period of 14 weeks. Feed and water were offered *ad libitum.*

At the growth phase, growth parameter (feed intake, weight gain and feed conversion ration) and mortality rate were monitored weekly. At the end of the sixth week, six quails were picked from each treatment for carcass evaluation. At the laying phase (week 7-14), eggs were collected twice (9.00 and 16.00 h) daily while feed intake, egg weight, egg size and egg quality indices were monitored weekly. Two eggs from each replicate were broken into flat plates for the determination of egg quality traits; albumen, yolk and shell weights as percentages of egg weight. The number of cracks per egg was also recorded. The shell thickness was measured with the micrometer screw gauge and yolk colour was determined using the Roche fan score method. Data collected were subjected to the one way analysis of variance and significant differences between means were separated using Duncan's multiple range tests as outlined by Steel and Torrie (1960).

Table 1: Composition of basal diets (%)

Ingredient	Starter	Layer
Maize	41.57	37.80
Soy bean meal	35.43	41.70
Crayfish dust	5.00	5.00
Palm kernel cake	4.00	2.00
Wheat offal	10.00	4.00
Bone meal	2.50	4.00
Lime stone	0.00	4.00
Vitamin premix[a]	0.50	0.50
Salt	0.50	0.50
Lysine	0.30	0.30
Methionine	0.20	0.20
Total	100.00	100.00
Calculated nutrient		
% CP	24.00	24.00
ME (kcal/kg)	2750.00	2650.00

Treatment 1: Basal diet; Treatment 2: Basal diet + 2.5% (25 g kg^{-1} of feed) AeBML, Treatment 3: Basal diet + 5% (50g/kg of feed); eBML; Treatment 4: Basal diet + 7.5% (75g/kg of feed) AeBML; Treatment 5: Basal diet + 10% (100g/kg of feed) AeBML; [a]Supplied the following per kg of diet: Vitamin A 75,000iu; Vitamin D_3 15,000iu; Vitamin E 75iu; Vitamin K_3 12.5 mg; Vitamin B_1 5 mg; Vitamin B_2 50 mg; Vitamin B_{12} 20 mg; Folic Acid 10 mg; Biotin 0.5 mg; Niacin 350 mg; BHT 625 mg; Calcium –D- Pantotenic Acid 100 mg

RESULTS

Results on growth performance indicated that final body weight, daily weight gain and feed conversion ratio were not significantly ($p>0.05$) influenced by dietary treatments Table 2. There were significant ($p<0.05$) effects of aqueous extract of bush marigold leaf on the average final weight, daily feed intake and mortality rate in growing quails. The mean value for the final body weight was 126.87, 120.65, 116.21 and 116.12 g for quails fed 2.5%, 5, 7.5 and 10% AeBML diet, respectively compared to that of the control (107.32 g).

Daily feed intake ranging between 13.97-15.70 g day^{-1} was significantly ($p<0.05$) different between dietary treatments. Quails fed the control diet had higher feed intake (15.70 g day^{-1}), followed by those fed 5% AeBML (14.31 g day^{-1}), 7.5-10% AeBML (14.26 g day^{-1}) and the least with quails fed 2.5% AeBML diet (13.97g day^{-1}). Mortality was significantly ($p<0.05$) lower in quails fed diets containing AeBML compared to those on the control diets.

Dietary AeBML supplementation had no effect ($p>0.05$) on the carcass characteristics of growing quails Table 3. However at increased levels of AeBML supplementation, dressed weight of quails was significantly ($p<0.01$) improved. There was progressive decrease in egg size as level of supplementation increased Table 4. Egg number (82.38-132.00) was higher ($p<0.001$) in quail hens fed 5% AeBML, followed by those on 7.5, 10 and 2.5% AeBML diets, respectively. The lowest value was obtained from birds fed the control diet.

Table 2: Influence of AeBML on the mean performance of growing quails

Mean performance	0% AeBML	2.5% AeBML	5% AeBML	7.5% AeBML	10% AeBML	Sem	LSD	Level of Sig.
Initial body weight (g)	16.52	15.52	14.45	14.00	17.11	0.53	4.22	NS
Final body weight (g)	107.32	126.87	120.65	116.21	116.12	3.65	26.60	NS
Average body weight (g)	84.75^{a}	82.19^{b}	84.71^{a}	80.41^{b}	82.22^{b}	6.13	2.27	**
Daily feed intake (g/day)	15.70^{a}	13.97^{b}	14.31^{b}	14.26^{b}	14.25^{b}	0.18	1.18	*
Daily weight gain (g/day)	18.87	18.79	19.69	18.85	18.07	0.62	2.91	NS
Feed conversion ratio (%)	0.83	0.74	0.73	0.77	0.79	0.04	0.26	NS
Mortality (%)	4.00^{a}	1.33^{b}	1.33^{b}	1.33^{b}	1.33^{b}	0.02	0.10	*

Difference superscripts (a and b) indicate significance ($p<0.05$, 0.01) difference between treatments

Table 3: Influence of AeBML on the carcass characteristic of growing quails

Characteristics	0% AeBML	2.5% AeBML	5% AeBML	7.5% AeBML	10% AeBML	Sem	LSD	level of Sig.
Initial body weight (g)	16.52	15.52	14.45	14.00	17.11	0.53	4.22	NS
Live weight (g)	107.32	126.87	120.65	116.21	116.12	3.65	26.60	NS
Daily weight gain (g day^{-1})	2.16	2.65	2.53	2.43	2.35	0.22	0.52	NS
Dressed weight (%)	65.53^{c}	69.37^{bc}	72.64^{b}	73.89^{a}	81.06^{a}	0.88	6.41	**
Leg weight (%)	1.97	1.95	1.87	1.92	1.89	0.03	0.29	NS
Organ weight (% LW)								
Proventriculus	1.19	1.01	1.01	1.14	1.24	0.09	0.65	NS
Gizzard weight	3.25	2.72	3.32	2.96	2.96	0.20	1.47	NS
Heart weight	0.84	0.77	0.82	0.23	0.98	0.02	0.16	NS
Liver weight	1.99	1.75	1.58	1.52	1.35	0.13	0.96	NS
Bile weight	0.13^{b}	0.12^{b}	0.10^{b}	0.12^{b}	0.17^{a}	0.01	0.04	*
Paired Lung weight	0.63	0.52	0.53	0.66	0.69	0.02	0.17	NS

Different superscripts (a, b and c) indicate significance ($p<0.05$, 0.01) difference between treatments

Table 4: Effects of AeBML on the morphometric qualities of quail eggs

Morphometric trait	0% AeBML	2.5% AeBML	5% AeBML	7.5% AeBML	10% AeBML	Sem	LSD	Level of Sig.
Egg size (g)	9.61^{b}	9.75^{a}	9.54^{c}	9.49^{d}	9.47^{d}	0.07	1.80	*
Egg no	82.38^{c}	113.75^{b}	132.00^{a}	117.13^{b}	114.25^{b}	5.31	11.17	***
Hen day production (%)	61.38^{d}	77.05^{b}	86.24^{a}	79.80^{b}	71.62^{c}	2.19	3.44	***
Albumen weight (% EW)	47.80^{d}	49.75^{c}	52.07^{a}	50.45^{b}	52.11^{a}	0.38	0.05	***
Yolk weight (% EW)	30.63^{e}	32.13^{d}	32.64^{c}	32.79^{b}	32.38^{a}	0.31	0.03	***
Shell weight (% EW)	21.57^{a}	18.12^{b}	15.29^{e}	16.76^{c}	15.51^{d}	0.48	0.12	***
% Crack	0.87^{a}	0.70^{ab}	0.68^{b}	0.68^{b}	0.65^{b}	0.01	0.18	*
ShellThickness (mm)	0.29^{b}	0.29^{b}	0.33^{a}	0.29^{b}	0.29^{b}	0.03	0.01	*
Yolk color	3.03^{d}	4.48^{c}	5.28^{b}	5.32^{b}	5.45^{a}	0.02	0.08	***

Difference superscripts (a, b, c, d and e) indicate significanct ($p<0.05$, 0.01, 0.001) differences between treatments; the % albumen, yolk and shell weights were between 47.80-52.07, 30.63-32.88 and 15.51-21.57%, respectively. % albumen and yolk weights increased as level of AeBML supplementation increases, while % shell weight decreased

DISCUSSION

The non-significant phytogenic effects of dietary AeBML supplementation on the performance of growing quails were in line with earlier reports (D'Mellow and Devandra, 1995; Alcicek *et al*., 2003; 2004) that plant products had no significant effects on the body weight of birds. The presence of some toxic factors inherent in leaf products have been implicated for the depression in feed intake (D'Mellow and Devandra, 1995) as observed in quails fed AeBML. Generally, it appears that dietary AeBML at 2.5-5% improved the growth performance of quails.

The present findings supported the notion that plant extracts improved the carcass yield of birds as reported by Alicicek *et al.* (2004) but contradicted the findings of Sarica *et al*. (2005) and Cabuk *et al*. (2006) that oregano leaf extracts had no significant effect on the carcass characteristics of birds. This could suggest that different plant extracts have varying effects on the carcass characteristics of birds.

Hen day production was improved especially in hens fed 5% AeBML agreeing with the results of Akande *et al*. (2008) that supplementation with *Tephrosia bracteolata* leaf meal improves hen day production in laying hens.

The inclusion of AeBML in the diets was observed to improve shell thickness and reduced ($p<0.05$) the amount of cracked or broken eggs in laying quails in line with the report of Akande *et al*. (2008). Also, the addition of AeBML in the diet of laying quails improved yolk pigmentation, indicative of high bio-availability of pigmenting agents in the leaf of bush marigold. The results supported the reports by earlier researchers (Al-Kirshi *et al*., 2010; Nhan *et al*., 1997; Cetingul *et al*., 2008) that supplementation with mulberry, peppermint, *Trichantera gigantean* and

Tephrosia bracteolate leaf meal, respectively increased the yolk pigmentation of laying birds. This however contradicts the report by Odunsi (2003) that supplementation with *Lablab purpureus* leaf meal had no significant effect on the internal egg quality of birds. These findings indicated that aqueous extract of bush marigold leaf exert significant phytogenic effects on egg production traits than on the growth performance in quails.

CONCLUSION

The study concludes that aqueous extract of bush marigold leaf has the potential to improve the growth performance, carcass yield and egg quality of quails. Optimum performance is achieved at dietary supplementation of 5% aqueous extract of bush marigold leaf in Japanese quails. This study recommends further investigation on the efficacy of aqueous extract of bush marigold leaf in other poultry species as alternative antibiotics.

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