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Abstract

This study was conducted to assess the effect of organic production on growth performance of broiler chickens. A total number of one-hundred and eighty (180) of Ross broiler chicks were used for this study and randomly allocated to four dietary and management treatments in triplicates of 15 birds per replicate. Four experimental diets formulated were Diet A was the control with the conventional feed while diets B, C, D are organic feed with exclusion of millet, sorghum and wheat respectively. Experimental diets were supplemented with known weights of leafy vegetable like *Amaranthus esculentus*, (succulent Amaranths), *Talinum triagularae* (water leaf), *Cellocia esculentus* (green) as source of vitamins and minerals. Data were obtained on Total Feed Intake (g/bird/day) (TFI), Total Weight Gain (g/bird/day) (TWG) and Feed Conversion Ratio (FCR) in response to the experimental diets. The convectional chickens had the highest ($P < 0.05$) significant values of 58.15 g/bird/day for TFI, 9.80 g/bird/day for TWG and 1.95 for FCR respectively in term of growth performance and followed were broilers fed with diet B (Organically raised birds' diet minus Millet) with values of 24.16g/bird/day, 7.09g/bird/day and 3.41 for TFI, TWG and FCR respectively. Among the organic chickens, the group B with the exclusion of millet had better performance in all parameters than the other groups, C and D respectively. It is recommended that pure organic poultry should not be practiced on a large scale; instead it should be done along with conventional because it can lead to loss in this part of the country. Further studies can be conducted to determine the actual requirement of this strain of broilers.

Keywords: Broiler Chickens, Feed Intake, Weight Gain, Feed Conversion Ratio, Organic Farming.

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Introduction

Organic agriculture is based on a worldview that can be called "holistic" (Merrill, 1983). In contrast to reductionism, holism focuses on the whole. The approach implies that wholes, for example agro-ecosystems, are more than the sum of their elements, and elements lose certain properties when their relationships with other elements are ignored (Hill, 1982). Because it is not possible to consciously take all elements and levels of organization (e.g. cell, organism, farm, region and biosphere) of the whole into account, organic agriculture may have a metaphysical or spiritual dimension. Also social questions, and thus values, such as concern for rural communities or fair trade, are components of organic agriculture (IFOAM, 2002). The increase in number of consumers demanding healthy and natural foods have favored organic livestock farming that is reputed to be environmentally friendly, sustaining animals in good health, with high welfare standards and resulting in high quality products (Sundrum, 2001). The primary characteristics of this production system are: a defined standards; greater attention to animal welfare (stocking density, perches, and free-range areas); no routine use of growth promoters, animal offal or any other additives; at least 80% of feed grown according to organic standards, without the use of artificial fertilizers or pesticides on crop or grass (Sundrum, 2001).

The higher guarantee of the absence of residues is certain, but the effect of this production system on the qualitative characteristic of the products is unknown. Organic farming can be defined as an approach to agriculture where the aim is to create integrated, humane, environmentally and economically sustainable agricultural production systems producing acceptable levels of crop, livestock and human nutrition, protection from pests and diseases, and an appropriate return to the human and other resources employed. Maximum reliance is placed on locally or farm-derived, renewable resources and the management of self-regulating ecological and biological processes and interactions. Reliance on external inputs, whether chemical or organic, is reduced as far as possible. In many European countries, organic agriculture is known as ecological agriculture, reflecting this reliance on ecosystem management rather than external inputs. (Lampkins *et al.*, 1997).

The general targets of organic production according to the Canadian Standards (2006) include the following: To protect the environment. Minimize soil degradation and erosion, decrease pollution, optimize biological productivity and promote a sound state of health, prepare attentive care that promotes the health and meet the behavioral needs of livestock, prepare organic products, emphasizing careful processing and handling methods in order to maintain the organic integrity and vital qualities of the product at all stages of production, rely on renewable sources of locally organized agricultural systems. The organic standard generally prohibits products that have been genetically altered and animal cloning. Prohibited products and practices must not be used on certified organic farms for at least three years prior to the harvest of the certified organic products. Livestock must be raised according to organic standards and must be fed at least 80% organic feed ingredient (Moses, 2011). Therefore, the aim of the study was to evaluate the effect of organic ingredients on general growth performance of broiler chickens from day old to 8weeks of age.

Materials and Methods

The research was carried out at the Poultry unit of the Teaching and Research Farm of Ladoke Akintola University of Technology, Ogbomoso, Oyo State. Ogbomoso is located in a derived savanna region of Nigeria (Amao *et al.*, 2013). The conventional feeds were purchased at a reputable feed mill in Ogbomoso. The organic feed ingredients such as maize, soybean, wheat and sorghum were sourced from the same feed mill. Feed ingredients for organic diet were processed in various ways as to reduce the anti-nutritional factors to the barest minimum. After processing in various ways for the removal of anti-nutrients, the test ingredients were milled and mixed in a local milling house (where household foodstuff are milled) to prevent contamination or mixing with conventional foods.

The experimental diets were supplemented with known weights of leafy vegetable like *Amaranthus esculentus*, (succulent Amaranths), *Talinum triagularae* (water leaf), *Cellocia esculentus* (green) as source of vitamins and minerals. These were shown in Tables 1 and 2**.** One hundred and eighty (180) unsexed day old broiler chicks of Ross breed were sourced from Ajanla farm, Lagos-Ibadan express ways, Oyo state, were used for this experiment. The birds were raised on deep litter but the treatment groups were allowed a period of three hours on the experiment range quadrants beside the poultry house when the birds were two weeks old. The pasture quadrants contained young succulent vegetables which include *Cellossia spp* (green), *Talinum triangulare* (waterleaf) and *Amaranthus esculentus* (amaranth). Prior to the arrival of the bird, the poultry house was scrubbed thoroughly with hot water and a solution of water and Neem tree extract (*Azadirachta indica*) was used to sprinkle the house as a disinfectant. This prevents microbial as well as insect encroachment. After this was done, the house was left for three days to dry off. Also, feeding troughs and drinkers were thoroughly washed with water and neem tree extract and later sun-dried.

On arrival of the birds, the control groups were administered clean water and retardants and glucose, while the treatment groups were given only water. The birds were later taught how to eat from their trays by dipping their beaks in feed and water. The experimental birds were randomly allotted to four dietary treatments with three replicates per treatment in a completely randomized design (CRD). Fifteen birds were allotted to each replicates making forty five birds per treatment and the study lasted for eight weeks. Drinkers were washed daily and fresh water was served *ad libitum.* Wood shavings whose chemical contents have been reduced using activated charcoal method was used in the pens of groups B, C and D while unprocessed wood shavings were used for birds in group (control group). Faecal droppings and wood shavings were removed from feeding and drinking troughs before fresh feeds were served. Litters were changed when due and dead birds were removed first thing in the morning. Vaccination and medication were given to the birds on the control as at when due. For the organic group of birds, the daily water administered to them was mixed with extracts of

neem tree and garlic. On occasions when there is morbidity, the sick birds were isolated and treated with conventional medications and they were not returned to the flock.

The following parameters were collected on feed intake (g), by feed given to both organic groups and control groups were weighed out daily. Before serving, and the remnants in the feeders were removed and kept separately. The total feed given and total leftovers were calculated at the end of each week. Feed consumption for each day was obtained by the difference between the total feed given and leftovers at each day. Average feed consumption per bird per replicate for the day was calculated by dividing the total weight of feed consumed by the number of birds in each replicate. The formula below indicates feed intake

$$\textit{Feed intake} = \frac{\textit{feed given} - \textit{left over feed}}{\textit{Period of time}}$$

Body weight (g): Birds in each replicate were weighed on arrival and subsequently weighed at the end of each week for the duration of the experiment. The average body weight per week was obtained from each replicate by dividing the total body weight in each replicate by the total number of birds in the replicate. Body weight gain (g): Body weight gain was calculated from the difference between the body weight for the given week and that of the previous week. Feed conversion efficiency (f/g) as the data obtained on average feed intake and body weight gain were to evaluate feed conversion efficiency using the expression.

$$\textit{Feed conversion ratio} = \frac{\textit{average feed intake per week (kg)}}{\textit{Average body weight gain per week (kg)}}$$

Statistical analysis

Data collected were subjected to one way analysis of variance (ANOVA) using SAS (2003), while the means were separated using Duncan multiple range test.

Results and Discussion

Plates 1, 2, 3, 4, 5, 6, 7 and 8 were water leaf, neem tree, Amaranthus, experimental site with the forages, Organic birds while feeding, Organic birds at 8 weeks and conventional birds at 8 weeks respectively. Tables 1 and 2 reveal the composition of the experimental diets starter and finisher respectively while the results of the proximate analysis of experimental diets presented in Table 3. At eight (8) weeks of age, there were significant differences ($P < 0.05$) in the feed intake of organic broiler chickens as shown in the table 4. Control group which were fed with conventional feed had the highest total feed intake 58.15g/bird/day than the other groups i.e. group B, C and D with 24.16/bird/day, 18.35g/bird/day and 14.42g/bird/day respectively. Total weight gain were highest for control group (9.80g/bird/day) follow by group B with value (7.09 g/bird/day) and the least values of 3.24 g/bird/day and 2.54 g/bird/day were obtained for group C and D respectively. Feed conversion ratio were highest for group B with value (3.41) follow closely by group C (3.24) and the lowest value observed was for group D (1.95). Organic broiler as expected, showed lower growth performance while compared with broiler fed on conversional feed and this agrees with the claims of Castellini, *et al*., (2002). Many authors have ascertained the effect of feed quality and management systems on feed conversion ratio of broiler birds (Oluyemi, *et al*., 2007; Lewis *et al*., 1997). Results from this study indicated that feed conversion ratio (FCR) of conventional birds were better than that of organically fed birds at the 8 week. The reason may be due to conditioning in the physiology of organic birds to the fed diets and, the outdoor access which increased their activities and probably reduced their body weight gain which agreed with the findings of Castellin, *et al*., (2002a). The lower feed intake recorded at the 8 weeks was due to the fact that organic birds consumed forages (asides formulated feed) and these forages contain flavonoids and carotenoids which are antioxidants and prevents excessive fat let-down was also compactable with the observation of Dariusz *et al*., (2011). The behaviour observations of the organic chicks showed more locomotory activity and less resting that lower weight gain had earlier documented by Andrews *et al*., (1997). Thus, their growth rate and feed efficiency were poorer. Also the uncontrolled environmental conditions in paddock could have increased their energy requirements with consequent increase of feed conversion.

Conclusion and Recommendations

From the scientific research, organic diet and management practices appears to have significant negative effects on the growth performance of broiler chickens. At the 8th week, growth within the organic birds was poor. The study also demonstrated that safe organic broiler chickens can be raised with diets with CP values ranging between 24.67% and 27.24% and metabolizable energy of between 3002.45 kcal/kg and 3067.63kcal/kg if allowed outdoor access, forages and exclusion of vaccines and synthetic medications. Based on the results of this study, it can be recommended that in Nigeria, organic production may not be 100% practiced; so far the proportion of organic ingredients is up to 70-80% and 20-30% of conventional as prescribed by IFOAM, (2002). Safe organic broiler chickens can be raised with diets with CP values ranging between 24.67% and 27.24%, and metabolizable energy of between 3002.45 kcal/kg and 3067.63kcal/kg if allowed outdoor access, forages; in addition to excluding vaccines and synthetic medications from their management systems. It is also recommended that more research be done in the aspect of organic birds' health and welfare.

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Tables

Table 1: Composition of Experimental Diets (Broiler Starter Mash)

Ingredients	**Group A(kg)**	**Group B(kg)**	**Group C(kg)**	**Group D(kg)**
Conventional maize	48.07	-	-	-
Organic wheat	-	14.01	14.99	-
Organic sorghum	-	14.01	-	13.99
Organic millet	-	-	14.99	13.99
Wheat offal	7.5	7.5	7.5	7.5
Full fat SBM	-	43.02	40.08	43.08
Commercial SBM	40.30	-	-	-
local fishmeal	-	2.50	2.50	2.50
palm oil -	2.0	2.0	2.0	
oyster shell	1.2	2.7	2.7	2.7
bonemeal	2.0	-	-	-
vit/min premix	0.25	-	-	-
methionione	0.18	-	-	-
lysine	0.25	-	-	-
Water leaf	-	2.50	2.50	2.50
Total	100	100	100	100
Calculated analysis				
ME kcal/kg	2872.67	3002.45	3019.00	3067.6
CP (%)	23.04	27.24	26.74	24.67
Crude fiber	3.75	3.90	4.01	4.00
Fat %	3.59	5.03	4.91	4.90

Table 2: Composition of experimental diets (broiler finisher mash)

Ingredients.	**Group A**	**Group B**	**Group C**	**Group D**
Conventional maize	45.00	-	-	-
Organic wheat	-	14.01	14.99	-
Organic sorghum	-	14.01	-	13.99
Organic millet	-	-	14.99	13.99
Wheat offal	10.00	7.5	7.5	7.5
Full fat SBM	-	43.02	41.08	43.08
Commercial SBM	18.25	-	-	-
Palm kernel cake	23.00			
local fishmeal	-	2.50	2.50	2.50
palm oil	-	2.0	2.0	2.0
oyster shell	1.2	2.7	2.7	2.7
bonemeal	1.50	-	-	-
vit/min premix	0.25	-	-	-
methionione	0.25	-	-	-
lysine	0.25	-	-	-
salt	0.30	0.25	0.25	02.5
Total	100	100	100	100
Calculated analysis				
ME kcal/kg	2712.67	3002.45	3019.00	3067.6
CP (%)	17.39	27.24	26.74	24.67
Crude fiber	5.16	3.90	4.01	4.00
Fat %	4.04	5.03	4.91	4.90

Table 3: Proximate Composition of Experimental Diets (%)

Parameter	Control	X-Millet	Y-Sorghum	Z-Wheat
Moisture	9.48	9.52	8.03	9.62
Crude protein	10.50	8.75	7.26	7.08
Crude fibre	9.80	6.02	4.11	8.23
Ether extractives	22.08	21.45	20.65	20.71
Ash	9.45	11.35	9.58	8.05

TABLE 4. Growth Performance of Broiler fed with Organic feeds and Vegetables

Parameter	Group A	Group B	Group C	Group D	SEM
TFI (g/bird/day)	58.15^{a}	24.16^{b}	18.35^{c}	14.42^{d}	2.03
TWG (g/bird/day)	9.80^{a}	7.09^{b}	3.24^{c}	2.54^{c}	1.20
FCR	1.95^{d}	3.41^{a}	3.24^{b}	2.54^{c}	0.91

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

TFI= Total Feed Intake, TWG= Total Weight Gain, FCR = Feed Conversion Ratio, (A): Conventionally Fed and Raised Birds, (B): Organically raised birds' diet minus Millet, (C): Organically raised birds' diet minus Sorghum, (D): Organically raised birds' diet minus Wheat.

Figures

Figure 1: Waterleaf (*Talinum triangularae)*

Figure 2: Neem tree (*Azardirachta indica)*

Figure 3: Amaranths

Figure 4: Organic birds while feeding

Figure 5: Organic birds at 8 weeks

Figure 6. Conventional birds at 8 weeks