The Effect of Feeding of Moringa Oleifera Leaves Mixed with Beetroot (*Beta Vulgaris*) on Performance of Broiler Birds in Abia State, Nigeria.

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The Effect of feeding *Moringa oleifera* leaves mixed with Beetroot (*Beta vulgaris*) on Performance of Broiler Birds in Abia State was carried out using microbiological methods. This study was carried out to determine the effect of *Moringa oleifera* leaves mixed with Beetroot (*Beta vulgaris*) on performance of broiler birds in Abia State. Twenty-four one day old unsexed white Cornish broiler chicks were used for the study. The birds were first raised in a brooding unit for 21 days and fed only on commercial feed. At the end of 21 days, feeding only on commercial feed, the birds were randomly selected into four experimental groups of six birds each. Group 1 (T_0) (control) were given 0 *Moringa oleifera* leaves mixed with Beetroot (MOLBM) and feed, Group2 (T_1) were given 5% MOLBM and feed, group 3 (T_2) were given 7.5% MOLBM and feed, while group4 (T3) were given 10% of MOLBM and feed respectively for 84 days. Weight gained by birds in all treatment groups were recorded weekly, diseases resistant ability and tenderness of broiler parts were noted throughout the 84 days the study lasted. The result obtained showed that broiler birds fed with 7.5% and 10% level of MOLBM did not manifest any disease out-break when compared to the control that showed symptoms of coccidiosis foul-pox and diarrhea. A one-way analysis of variance (ANOVA) and a Duncan multiple range comparison test were carried out on the data generated with a statistical difference attained at 95% confidence level ($P<0.05$). Statistical Products and Service Solution (SPSS) version 22 was used for data analysis. There was significance difference ($P>0.05$) in serum antioxidant parameters, Carcass weight analysis, WBC differentials, Haematological parameters, Lipid profile, Liver function parameters, Organ weight analysis and Renal function parameters of broiler birds fed with MOLBM and feed. The research recommends that include of MOLBM in diet to feed broilers for economic, empowerment and food sustainability is necessary.

Keywords: Moringa Oleifera, Beetroot, Poultry, Feeds

Introduction

Poultry farming is the form of animal husbandry which raises domesticated birds to produce meat or eggs food. It produces high quality proteins for human nutrition. It is also a source of income for families in many countries (Tarlyel *et al.*, 2012). The moringa oleifera is a multi – purpose tree with a variety of potential uses. Its leaves, pods, seeds, flowers and roots are edible and have different nutritional values (Oyeyinka 2018, Mahanta et al 2017, Malifuz et al 2018). According to Alinidawi, et al, 2016, the benefits of moringa include among others- increasing the natural defenses of the body, provide nourishment to the eyes and brains, promotes functioning of liver, kidney and others. Based on research, the plant is nutritious earning it the world health organization candidate in the fight against mal-nutrition (WHO, 2008)

Beetroot is one of several cultivated varieties of *Beta vulgaris* grown for their edible taproots and leaves (called beet green) (Siervo *et al.*, 2013). Beetroots have been associated with numerous health benefits, including improved blood flow, low blood pressure and increased exercise performance. Many of these benefits are due to their high content of inorganic nitrates.

Based on these nutritional and health benefits of moringa oleifere leaves and beetroots, it was the belief of the researcher that both plants will have some positive effect on broiler performance in terms of weight gain and disease resistant in broilers that are in Abia state, Nigeria. The greatest challenge of the Nigeria poultry industry is disease and infection. This causes reduction of weight gain especially in broilers and reduction or complete cessation of egg laying in layer. Yakubu (2010) and Karmani, *et al*, (2010).

Materials and Methods

Area of the Study

The research was carried out at the poultry unit of the Animal House at Abia State Polytechnic Aba. Abia State lies within approximately latitude $4^0 4^0$ and $6^0 14^0$ North and Longitude $7^0 10$ and 80 east. It covers an area of about 5,833,999 million people (Federal Republic of Nigeria, NPC 2007)

Population of the Study

The total population for the study was twenty-four unsexed day-old Cornish breed of broilers. The Cornish breeds of broilers were selected by the researcher because of the outstanding quality of the breeds for use in researches and ease breeding.

Experimental Animal Management

The entire population was involved in the study. The birds were sourced from a reputable outlet of Chi farm Ibadan in one of their branches located in Umungasi Road Aba. The birds on animal were first stocked at the brooding unit or the poultry house. Deep litter system of poultry management was adopted. The deep litter system was viewed as a sustainable method of managing chicks in coop by farmers (Laureen, 2009) especially if the birds were raised for research purposes. Wood -shaving were spread on top chain concrete floor to absorb urine and faeces of the birds, electric bulbs (100 watts) and kerosene stove served as heat and lightening sources especially during the brooding stage. Routine management practices were strictly followed.

Processing of Experimental Plants

Harvested *Moringa oleifera* leaves and beetroot bulbs slices table tops to dry for 3 – 4 days under room temperature. Drying at room temperature was necessary to ensure that leaves do not bleach and lose their nutrients. Shade – dried leaves of moringa retained chlorophyll more than those dried in under the sun and in the oven. Bengyin Chee, 2013 recommended that medicinal leaves be air dried at room temperature with the aid of circulating air flow using fans as direct sun light may destroy some heat sensitive phytochemicals. It is necessary to reduce the level of moisture content to at least 10^0C to avoid fungal infestation in the meal.

The dried leaves and beetroots were crushed with palms when still crisp to form Moringa oleifera leaves and beetroot meal (MOLBM) for use with commercial feeds to feed the birds.

Experimental Meal (MOLBM)

After the twenty-one (21) days preliminary feeding period to accusation, the birds to the environmental condition and establish a feeding pattern, the birds were weighed each with a standard 20kg weighing scales and recorded, then taken to any of the four (4) treatment pens designated A, B, C and D respectively. The birds in the various treatment groups were tagged with various ink colours of black (T_0), Pink (T_1), Red (T_2), and Green (T_3) respectively. Each treatment group had (12) birds each assigned to it for receiving the assigned experimental meal (MOLBM).

Group A (T_0) served as control and received O MOLBM + feed, Group B (T_1) received 2.5% MOLBM and Feed, Group C (T_2) received 5% MOLBM and Feed while Group D (T_3) received 10% MOLBM and Feed.

Results and Discussion

Statistical analysis

A one-way analysis of variance (ANOVA) and a Duncan multiple range comparison tests were carried out on the data generated with a statistical significance difference attained at a 95 % confidence level ($P < 0.05$). Statistical Products and Service Solutions (SPSS) version 22 was used for the data analysis. The effect of feeding *Moringa oleifera* leaves mixed with beetroot (MOLBM) on growth performance of broiler birds during 84 days period of feeding. Table 1 showed Serum antioxidant parameters, Table 2 showed Carcass weight analysis, Table 3 showed WBC differentials, Table 4 showed Haemotological parameters, Table 5 showed Lipid profile, Table 6 showed Liver function parameters, Table 7 showed Organ weight analysis while Table 8 showed Renal function parameters. Values are presented as mean ± standard deviation (n= 3) and values with different letter superscript are significantly different ($P<0.05$) from paired mean across row.

Table 1: Serum antioxidant parameters

Treatment groups	T0R	T1R	T2R	T3R
GSH (mg/dl)	8.49 ± 0.17^{a}	9.16 ± 0.12^{b}	9.59 ± 0.23^{c}	9.80 ± 0.20^{c}
GPx (g/dl)	30.74 ± 0.66^{a}	$32.27\pm1.62^{a,b}$	$33.60\pm0.77^{b,c}$	34.92 ± 0.24^{c}
SOD (mg/dl)	36.21 ± 0.47^{a}	$37.41\pm0.71^{a,b}$	38.45 ± 0.46^{b}	39.92 ± 0.96^{c}
CAT (u/l)	17.94 ± 1.90^{a}	$18.55\pm0.80^{a,b}$	$19.77\pm0.41^{a,b}$	20.10 ± 0.39^{b}
MDA (mmol/L)	0.27 ± 0.01^{c}	0.22 ± 0.01^{b}	$0.21\pm0.02^{a,b}$	0.18 ± 0.03^{a}

Values are presented as mean ± standard deviation (n = 3); and values with different letter superscripts are significantly different ($P < 0.05$) from paired mean across the row.
GSH - Glutathione
GPx - Glutathione peroxide
SOD - Superoxide dismutase
CAT - Catalase
MDA – Malondialdehyde

Table 2: Results of carcass weight analysis

Treatment groups	T0R	T1R	T2R	T3R
Dressed weight (%)	93.83 ± 0.32^{a}	97.69 ± 0.79^{c}	94.51 ± 0.21^{a}	95.45 ± 0.22^{b}
Thigh weight (%)	22.01 ± 0.41^{c}	21.53 ± 0.10^{c}	23.73 ± 0.12^{d}	20.55 ± 0.27^{a}
Drum stick (%)	12.60 ± 0.26^{b}	22.57 ± 0.27^{c}	23.67 ± 0.08^{d}	10.84 ± 0.11^{a}
Breast weight (%)	26.53 ± 0.05^{b}	25.75 ± 0.11^{a}	25.15 ± 0.26^{a}	32.84 ± 0.61^{c}
Wings weight (%)	7.87 ± 0.09^{c}	7.15 ± 0.09^{b}	6.81 ± 0.06^{a}	7.18 ± 0.12^{b}
Legs (%)	3.90 ± 0.11^{d}	2.99 ± 0.04^{b}	3.76 ± 0.08^{c}	2.81 ± 0.05^{a}
Others (%)	21.88 ± 0.13^{b}	21.68 ± 0.23^{b}	19.84 ± 0.10^{a}	22.76 ± 0.14^{c}
Live weight (g)	3200.00 ± 20.00^{a}	3500.00 ± 20.00^{b}	3833.33 ± 30.55^{c}	4200.00 ± 30.00^{d}

Values are presented as mean ± standard deviation (n = 3); and values with different letter superscripts are significantly different (P < 0.05) from paired mean across the row.

Table 3: WBC differentials

Treatment groups	T0R	T1R	T2R	T3R
Neutrophils (%)	37.00±2.00a	39.33±0.58a,b	39.33±1.16a,b	40.00±1.73b
Lymphocytes (%)	56.33±2.52a	53.67±2.02a	54.03±1.13a	54.00±1.00a
Monocytes (%)	4.33±0.58a	4.33±1.16a	4.00±1.00a	3.67±0.58a
Eosinophils (%)	2.33±0.65a	2.67±0.45a	2.67±0.58a	2.33±0.57a
Basophils (%)	0.00±0.00a	0.00±0.00a	0.00±0.00a	0.00±0.00a

Values are presented as mean ± standard deviation (n = 3); and values with different letter superscripts are significantly different (P < 0.05) from paired mean across the row.

Table 4: Haematological parameters

Treatment groups	T0R	T1R	T2R	T3R
RBC ($X10^6/mm^3$)	$2.89±0.14^a$	$3.07±0.05^b$	$3.41±0.03^c$	$3.91±0.04^d$
PCV (%)	$25.00±2.00^a$	$26.33±0.58^a$	$30.00±1.00^b$	$34.33±0.58^c$
Hb (g/dl)	$10.13±0.32^a$	$10.73±0.25^b$	$11.70±0.26^c$	$12.80±0.20^c$
WBC ($X10^3/mm^3$)	$18.92±1.06^a$	$20.32±0.50^{a,b}$	$21.30±0.72^b$	$21.87±0.74^c$
MCV (pg)	$86.62±0.60^a$	$85.77±0.79^a$	$88.05±2.18^a$	$87.73±0.83^a$
MCH (fl)	$35.12±0.62^b$	$34.96±0.30^b$	$34.34±0.57^b$	$32.71±0.22^a$
MCHC (g/dl)	$40.54±0.47^c$	$40.76±0.38^c$	$39.01±0.56^b$	$37.28±0.32^a$

Values are presented as mean ± standard deviation (n = 3); and values with different letter superscripts are significantly different (P < 0.05) from paired mean across the row.
RBC - Erythrocyte count
PCV - Packed cell volume
HB - Hemoglobin
WBC - White blood count
MCV - Mean corpuscular volume
MCH - Mean corpuscular hemoglobin
MCHC - Mean corpuscular hemoglobin concentration

Table 5: Lipid profile

Treatment groups	T0R	T1R	T2R	T3R
Total Cholesterol (mg/dl)	$113.34±4.27^c$	$105.12±1.63^{b,c}$	$103.48±3.02^b$	$93.19±2.90^a$
Triglycerides (mg/dl)	$81.24±0.96^b$	$77.75±1.70^{a,b}$	$76.57±0.88^{a,b}$	$73.68±3.25^a$
HDL-C (mg/dl)	$60.38±0.57^a$	$62.17±1.93^{a,b}$	$65.61±1.22^{b,c}$	$66.71±0.91^c$
LDL-C (mg/dl)	$36.71±3.78^c$	$27.39±1.86^b$	$22.56±4.20^b$	$11.75±1.87^a$
VLDL-C (mg/dl)	$16.25±0.19^b$	$15.55±0.34a^{,b}$	$15.31±0.18^{a,b}$	$14.74±0.65^a$

Values are presented as mean ± standard deviation (n = 3); and values with different letter superscripts are significantly different (P < 0.05) from paired mean across the row.

Table 6: Liver function parameters

Treatment groups	T0R	T1R	T2R	T3R
Total protein (g/dl)	3.16±0.04a	3.52±0.03^{b}	3.75±0.04^{c}	4.17±0.04^{d}
Albumin (g/dl)	1.64±0.08a	1.94±0.04^{b}	2.07±0.03^{c}	2.18±0.04^{d}
Globulin (g/dl)	1.52±0.05^{a}	1.58±0.06^{a}	1.68±0.01^{b}	2.00±0.02^{c}
ALT (u/l)	31.67±1.53^{b}	29.00±1.00^{a,b}	25.67±4.04^{a}	30.33±2.52^{a,b}
AST (u/l)	40.33±2.52^{a}	38.00±1.73^{a}	37.00±2.65^{a}	38.00±3.46^{a}
ALP (u/l)	93.67±3.22^{a}	89.67±4.04^{a}	93.00±3.00^{a}	91.33±4.04^{a}
Bilirubin (mg/dl)	0.56±0.02^{b}	0.52±0.03^{a}	0.53±0.03^{a,b}	0.50±0.02^{a}

Values are presented as mean ± standard deviation (n = 3); and values with different letter superscripts are significantly different (P < 0.05) from paired mean across the row.

Table 7: Results of organ weight analysis

Treatment groups	T0R	T1R	T2R	T3R
Live weight (g)	3200.00±20.00^{a}	3500.00±20.00^{b}	3833.33±30.33^{c}	4200.00±30.00^{d}
Proventriculus (%)	0.36±0.03^{a}	0.50±0.02^{c}	0.44±0.02^{b}	0.42±0.02^{b}
Filled gizzard (%)	1.91±0.02^{c}	2.37±0.03^{d}	1.81±0.04^{b}	1.65±0.03^{a}
Empty gizzard (%)	1.54±0.04^{c}	1.99±0.04^{d}	1.43±0.03^{b}	1.25±0.01^{a}
Heart (%)	0.42±0.03^{a}	0.82±0.01^{d}	0.53±0.02^{c}	0.47±0.02^{b}
Liver (%)	1.96±0.03^{a}	2.23±0.03^{b}	2.54±0.22^{c}	2.46±0.10^{c}
Spleen (%)	0.11±0.01^{a}	0.13±0.01^{b}	0.22±0.01^{g}	0.16±0.01^{c}
Crop (%)	0.42±0.02^{a}	0.64±0.03^{d}	0.55±0.01^{c}	0.47±0.02^{b}

Values are presented as mean ± standard deviation (n = 3); and values with different letter superscripts are significantly different (P < 0.05) from paired mean across the row.

Table 8: Renal function parameters

Treatment groups	T0R	T1R	T2R	T3R
Urea (mg/dl)	10.97±0.48^{c}	10.69±0.23^{b,c}	9.96±0.32^{a}	10.24±0.24^{a,b}
Creatinine (mg/dl)	0.88±0.03^{a}	0.84±0.04^{a}	0.84±0.07^{a}	0.83±0.08^{a}
Na+ (mEq/L)	119.23±1.10^{a}	122.87±2.08^{b}	127.93±0.90^{c}	129.23±1.36^{c}
K+ (mEq/L)	4.48±0.12^{a}	4.45±0.06^{a}	4.46±0.09^{a}	4.48±0.04^{a}
Cl- (mEq/L)	83.10±2.78^{a}	80.17±2.87^{a}	82.03±2.23^{a}	81.53±2.76^{a}
HCO3- (mmol/L)	18.70±0.20^{a}	18.53±0.15^{a}	18.63±0.25^{a}	18.43±0.15^{a}

Values are presented as mean ± standard deviation (n = 3); and values with different letter superscripts are significantly different (P < 0.05) from paired mean across the row.

Discussion

The result of this study revealed that broiler birds feed 10% of MOLBM had the highest weight gain when compared to the other treatment group and the consist group (0, 7.5% & 10%) respectively. The findings of this study are in line with the findings of Kakengi *et al.*, (2007), Olugbemi *et al*, 2010) who found out that the inclusion of Moringa Oleifera leaves in the diet of broiler significantly (P>0.05) enhance their weight gain more than the control group. The results

obtained in this study was in agreement with the findings of Kumari, *et al*, 2014. The increase in weight gain of broilers fed with varying levels of Moringa Oleifera leaves mixed with beetroot was also supported by the studies carried by Farooq *et al.*, 2007, which showed that different parts of Moringa Oleifera plant contain a profile of important minerals that are a good source of protein, vitamins , beta-carotene, amino acids and various .phenolic which may have led to the varying increase in weight recorded by the study.

The study discovered that broiler birds fed 10% MOLBM had the highest weight gains when compared to the other treatment groups and the control. This result disagrees with the research findings carried out by Gakuya *et al*, 2014, who observed the MOLBM supplementation above. 7.5% decreased the feed intake and dry matter digestibility. The differences could be because of the inclusion of Beetroot in my work which helps in building of weight on the broilers. Table 1 (Serum antioxidant parameters) values showed significantly different ($P<0.05$) as the percentage increases so are the values. Table 2 showed the results of Carcass weight analysis as the value are significantly different ($P<0.05$) across the row.

The researcher discovered that there was significant different ($P<0.05$) on the effect of *Moringa* oleifera leaves mixed with Beetroot (MOLBM) on the experiment base on To, T1, T2 and T3. The result showed that Moringa Oleifera leaves mixed with Beetroot (MOLBM) led to appreciable increase in weight gain at 10% level of inclusion.

Conclusion

i. The study had successfully provided information to poultry farmers on the nutritional and health benefits derived from *Moringa oleifera* leaves mixed with beetroot meal in broiler feeds.
ii. It had provided information to livestock feed industries on the immense nutritional and health benefits on weight gains and disease resistant in broiler.
iii. It had provided information to ministry of Agriculture on the immense nutrition and health benefits derived from *Moringa oleifera* leaves mixed with beetroot.
iv. It had provided information to future researchers in area where further researcher could be carried out using other parts of *Moringa* oleifera plant for livestock production.
v. *Moringa oleifera* mixed with beetroot improved the growth performance, feed conversion, ratio and health status of broiler chicken without antibiotic prophylactic treatment.

Recommendations

These results suggested that *Moringa oleifera* leaves mixed with Beetroot meal could be used as a feed additive for broiler to improve growth performance without adverse effects, with addition of 10% in the diets. This review study highlights that *Moringa oleifera* mixed with beetroot fruitfully used as an effective natural growth promoter as well as an immune boosting agent. Although *Moringa oleifera* mixed with Beetroot was used in the experimental diets of poultry. Further study was recommended by various researchers regarding the closes of *Moringa oleifera* on optimum performance and sound health broilers. Thus, the future study should be conducted in a proper way so that it will examine the uses of *Moringa oleifera* in a reaction to pathogen challenges as well as dosages.

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