INTERNATIONAL JOURNAL OF PHYTOFUELS AND ALLIED SCIENCES
(A Journal of the Society for the Conservation of Phytofuels and Sciences)
(http://www.phytofuelsciences.com) (ISSN 2354 1784)

Comparative Effects of Different Components of *Moringa Oleifera* Seed Products on Body Weight and Growth Rate in Broilers and Pullets Strains

Daramola O.T , Sola-Ojo, F.E., and *Toye, A.A

Quantitative, Molecular and Functional Genetics Group,
Department of Animal Production,
University of Ilorin.
Corresponding Author address: ayo.toye @btinternet.com
Tel : +234-8131011392

ABSTRACT

The effects of early feeding of *Moringa oleifera* Seed Meal, Seed Cake and Seed Oil (MOSM, MOSC and MOSO) on performance from 0–4 weeks age was examined in broiler (32 Marshall strain MB) and pullet (32 Harco black strain, HB) chicks which included: the control diet (CTRL), basal diet supplemented with 10% *Moringa oleifera* whole seed (MOWS), 6% *Moringa oleifera* seed cake (MOSC) and 4% *Moringa oleifera* Seed Oil (MOSO). MOSM, MOSC and MOSO were supplied to the birds for four weeks only, after which all birds were fed the conventional diet. The performance effects of diet within the breed indicated that the MB strain fed control and 4% MOSO were not significantly ($p>0.05$) different in body weight but were significantly ($p<0.05$) bigger than those fed 10% MOSM and 6% MOSC from day old to 4 weeks, but within the Harco strain, those fed control diet were significantly ($p<0.05$) bigger than birds fed *Moringa oleifera* seed product. Growth rate was significantly affected by within and between all the two genotypes, the MB strain however show a constant and uniform growth rate within the strain and interaction between the two genotype shows a significantly ($p<0.05$) different rate compared to the HB strain even when conventional diet was given to the birds. The results of this findings showed that within the broiler birds addition of *Moringa oleifera* seed oil contributed to overall body weight as in control diet while addition of *Moringa oleifera* seed meal and cake affected the body weight negatively but , HB grow more slowly and distorted rate and they responded negatively to the varying proportion of *Moringa oleifera* seed product in their diet.

.....

Key words: *Moringa Oleifera* Seed, Broilers, Pullets, Body weight.

INTRODUCTION

Animal Nutrition has taken new dimension in recent years in terms of seeking for alternative feed ingredients, due to non availability and affordability of conventional feed ingredients. Conventional feed ingredients are out of reach of many farmers, thus making animal production more expensive as feed account for over 60% of total cost of production (Atteh, 2004). To alleviate the problem of shortage of animal feed, animal nutritionists over past decades have focused on the use of non conventional feed ingredients that are readily available and affordable. Plant products have been used for centuries by humans as food and to treat ailments. Natural medicinal products originating from herbs and spices have also been used as feed additives for farm animals of ages.

The use of *Moringa oleifera* leaves and seeds in feeding of poultry birds especially broilers has been reported (Oludoyi and Toye, 2012). Compaore *et al.* (2011) and Toye *et al.* (2013) reported that Moringa *oleifera* seeds are good source of fats, protein and minerals. The Moringa seed has quality attributes that make it a potential replacement for some protein rich feed ingredients. The advantage of using Moringa seed for a protein resource are numerous and include the fact that it is a perennial plant that can be harvested several times in one growing season, does not require re growing every season, and also has the potential to reduce feed cost. Despite the information about the use of Moringa *oleifera* leaves and seeds as sources of unconventional feeds for poultry, little is known about the use of oil extracted from Moringa *oleifera* seeds and the defattened seed (i.e. the cake) as unconventional feed for poultry. Chambers (1990) stated that body weight at a specific age is the most frequently used indicator of growth and growth rates in birds are categorized into two levels-high and low growth capacity. This shows that body weight and growth rate are important yardsticks in determining development of all animals .This experiment was designed to determine whether Moringa *oleifera* seed products are useful as non-conventional feedstuffs in feed formulated for chicken by assessing growth and performance effects of birds fed different components of Moringa *oleifera* seed products at early stage of life as well as the performance of birds when fed conventional diets thereafter.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Animal Pavilion of the Animal Production Department, Faculty of Agriculture, University of Ilorin. All animal experiments were conducted in line with the University's guidelines for ethical treatment of experimental animals in accordance with best practise within Institutional Animal Care and Use Committee (IACUC) guidelines.

Sources of Experimental Birds and Experimental diets

Day-old broilers and pullet chicks (Marshall and Harco Black Breeds) were purchased from Obasanjo Farm, Ota, Ogun state. A total of 64 chickens were used for the experiment comprising 32 broiler and 32 pullet chicks. Within each breed, the birds were randomly assigned to four dietary treatments comprising of control diet, 10% *Moringa oleifera* seed meal, 6% *Moringa oleifera* seedcake and 4% *Moringa oleifera* oil. Such that there were eight birds in each of the four treatment groups in each breed. The control diet was formulated to meet the requirement of broiler birds according to NRC (1994) with percentage Crude Protein of 23 % and Metabolizable energy of 3000Kcal/Kg. 10, 6 and 4 % of the control was replaced with MOSM, MOSC, and MOSO respectively.

Management of Experimental Birds

The chicks on arrival were counted and observed for health status. They were then weighed and randomly distributed to treatment groups. One hundred watts bulbs were used to provide heat for the newly hatched chicks to meet brooding requirement according to Atteh, (2004). Anti-stress was administered to the chicks via drinking water. The birds were vaccinated in order to prevent mortality and morbidity from infectious diseases (MVM, 1986). Feed and water were supplied *adlibtum* throughout the experimental period.

Data collection.

The birds were winged tagged on arrival for proper identification and were randomly distributed into the brooding pen, they were weighed singly from day old to 4 weeks of age using the electronic weighing scale and 10kg Camry scale thereafter. The growth rate was calculated using the body weight records by expression described by Maciejowski and Zieba (1982) viz:

$I = [(T2 – T1) / (T2 + T1)/2] \times 100.$

Where:

I= Growth rate per unit period (%).

T1= Average initial reading for the stated period (g or cm)

T2= Average final reading for the stated period (g or cm).

Statistical Analysis

The General Linear Model procedure of SPSS (SPSS 16, IBM) was used to analyse the data in a Completely Randomised Design and significantly different means were separated by Duncan's Multiple Range Test. (Duncan, 1955).

RESULTS

Within the Broiler breed (Marshall), significant difference ($p<0.05$) in body weight was observed between diet groups, control and MOSO were significantly ($p<0.05$) heavier than seed meal and seed cake groups from week 1 to 7 irrespective of the diet (Table 1).

Also in the pullet (Harco Black) breed, seed meal and seedcake had significantly ($p<0.05$) lower body weight than other diet groups from week 1 to 4 during which the chickens were fed the experimental diet and from week 4 – 7 in which all groups were fed a conventional diet (Table 2). No significant ($p>0.05$) differences were o bserved in hatch weight among the Harco pullet groups assigned to different *Moringa* based diets (Table 2) , but there were significant ($p<0.05$) differences in hatch weight among the broiler groups (Table1) .At weeks 2, 3 and 4, Hubbard broiler fed the control diet had significantly ($p<0.05$) higher body weight than any other group within the genotype except those fed 4 % MOSO that was not significantly bigger (147g vs 135g, 312g vs. 292g, 447g vs. 432.5g) than the control. Also pullets fed 10% MOSM and 6% MOSC had significantly lowest body weight compared to others within and between genotypes of birds studied at weeks 2, 3, and 4 (Tables 1 and 2). The rate of growth in Marshall broiler as shown in Figure 1 indicated a drastic reduction in the rate of growth in Marshall broiler from 1- 2 and 2 – 3wk after which they grow at a uniform rate from 3-4wk and 4-7 wk when they were fed conventional diet, while in the Harco Black pullets strain, there was an increase in the rate of growth from week 1 to 4, a reduction from week 4 to 7. The growth rate was significantly ($p<0.05$) different from hatch to two weeks old when the two strains of birds were considered simultaneously (Fig 1).

Table 1: Body weight of Marshall chickens fed different components of *Moringa oleifera* seed (DCMOS) from hatch to 4 weeks age and conventional diet from 4 to 7 weeks.

Age Wks	Marshall Body weight (g)			
	Control diet	**10% MOSW**	**6% MOSC**	**4% MOSO**
0	59 ± 1.21 (8)^{c}	51.63 ± 1.12 (8)^{bc}	45.88 ± 6.15 (8)^{ab}	58.03 ± 3.93 (8)^{c}
1	147.63 ± 6.88 (8)^{e}	100.75 ± 4.42 (8)^{d}	90.5 ± 4.94 (8)^{cd}	135.88 ± 13.18 (8)^{e}
2	312.63 ± 16.84 (8)^{d}	172.5 ± 10.13 (8)^{c}	144.38 ± 6.2 (8)^{bc}	292.38 ± 29.08 (8)^{d}
3	447.75 ± 30.7 (8)^{d}	263.75 ± 15.33 (8)^{c}	203.88 ± 14.99 (8)^{bc}	432.5 ± 47.84 (8)^{d}
4	677.5 ± 38.49 (8)^{e}	387.38 ± 25.46 (8)^{d}	283 ± 20.49 (8)^{c}	715.63 ± 81.65 (8)^{e}
5	867.5 ± 60.24 (8)^{c}	606.43 ± 32.67 (7)^{b}	465 ± 32.53 (8)^{b}	933.75 ± 118.23 (8)^{c}
6	1228.13 ± 88.06 (8)^{d}	955 ± 56.91 (7)^{c}	732.5 ± 51.47 (8)^{b}	1306.43 ± 132.26 (7)^{d}
7	1550 ± 146.08 (8)^{d}	1292.86 ± 87.58 (7)^{c}	981.88 ± 64.33 (8)^{b}	1691.67 ± 147.43 (6)^{d}

***Group mean, standard error and count are presented as; means ± sem (n) a,d means with different superscripts within genotypes and between diets are significantly different (P<0.05).**

Table 2: Body weight of Harco Pullets Chickens fed Different Components of *Moringa oleifera* seed (DCMOS) from hatch to 4 weeks age and Conventional diet from 4 to 7 weeks.

Age Wks	Harco Body weight (g)			
	Control diet	**10% MOSW**	**6% MOSC**	**4% MOSO**
0	41.38 ± 1.83 (8)^{a}	37.38 ± 0.96 (8)^{a}	37.99 ± 1.07 (8)^{a}	40.39 ± 0.94 (8)^{a}
1	79 ± 2.67 (8)^{bc}	54.88 ± 1.47 (8)^{a}	56 ± 1.36 (8)^{a}	68.75 ± 2.49 (8)^{ab}
2	141.75 ± 5.4 (8)^{bc}	83.88 ± 2.58 (8)^{a}	79.88 ± 3.59 (8)^{a}	118.13 ± 5.41 (8)^{ab}
3	204.13 ± 10.44 (8)^{bc}	103 ± 4.76 (8)^{a}	123.75 ± 11.8 (8)^{a}	165.75 ± 8.88 (8)^{ab}
4	255.88 ± 11.11 (8)^{bc}	118.13 ± 4.81 (8)^{a}	152.5 ± 8.96 (8)^{ab}	217.5 ± 17.88 (8)^{abc}
5	291.88 ± 11.18 (8)^{a}	175 ± 4.63 (8)^{a}	219.38 ± 14.44 (8)^{a}	261.25 ± 21.48 (8)^{a}
6	364.5 ± 16.16 (8)^{a}	223.75 ± 7.95 (8)^{a}	263.13 ± 20.57 (8)^{a}	328.13 ± 24.73 (8)^{a}
7	448.63 ± 24.64 (8)^{a}	290 ± 15.95 (8)^{a}	331.88 ± 31.47 (8)^{a}	414.38 ± 30.2 (8)^{a}

***Group mean, standard error and count are presented as; means ± sem (n)a,d means with different superscripts within genotype and between diets are significantly different (P<0.05).**

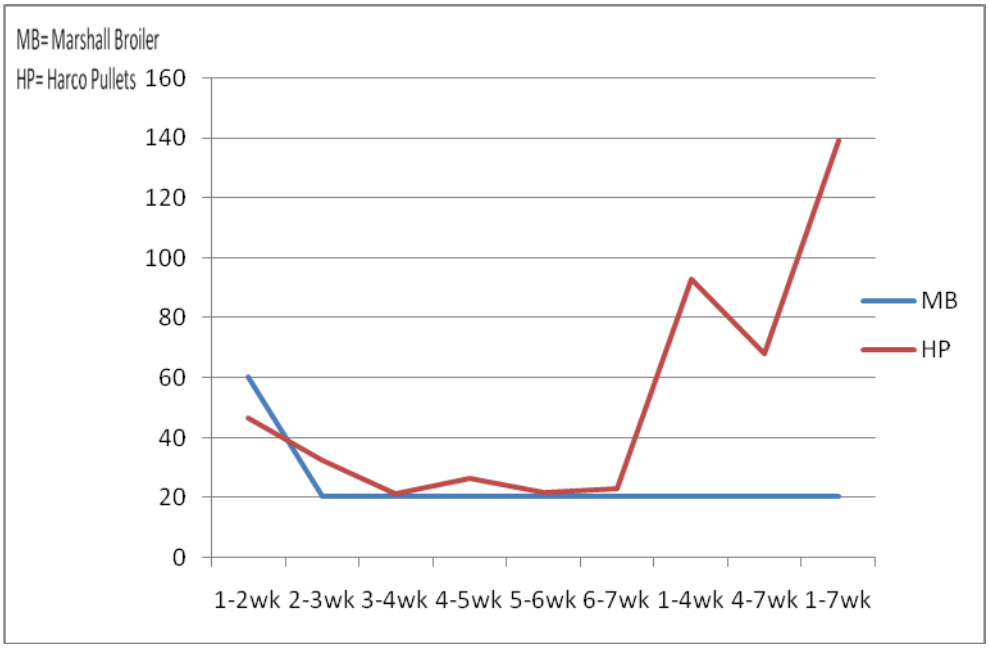

Figure 1. Growth rate of Marshall Broiler and Harco Pullets group fed Different Components of *Moringa oleifera* Seed.

DISCUSSION

The result obtained shows that Broilers fed control diet gained more weight than those fed the *Moringa* based diets over the period of weeks 1- 3 during which different components of *Moringa oleifera* seed products were included in diets, but at the latter period of weeks 4-7 after different components of *Moringa oleifera* seed inclusion terminated, those fed seed oil diet gained more weight than other diet groups, while the Seed cake diet had the least weight gain throughout the experiment. 10% *Moringa* seed meal group had a lower weight compared to the control diet. This result contradicts the findings of Olaniyan (2012) who reported that feeding 10% *Moringa* seed to broilers increased live body weight than the control diet. The results however agreed with the observation of Abbas and Ahmed (2012) who noted a reduction in body weight of broilers fed higher level of *Moringa oleifera* undecorticated seeds powder (MOUP) due to the presence of phytase which is considered an anti- nutritional factor.

In the pullet breed, results showed that the pullets fed the control diet gained more weight than those fed the *Moringa* diets during and after inclusion of *Moringa oleifera* seed as supplements and the seed meal group had the lowest weight in contrast to what was observe in the broiler group . This may be due to the differences in genetic composition between the two strains of birds used in this experiment, and could be regarded as a nutrigenomic effect.

Uniform rate of growth observed in the Marshall broiler groups corresponds with the findings of Sola-Ojo and Ayorinde (2010)

where it was stated that broiler birds grows at uniform rate when subjected to the same management condition. The growth rate curve however indicated a gradual reduction within the Harco black pullets strain especially when they were fed different components of *Moringa* seed from week 1 to 4 and a slight increase from week 4 to 5, 5 to 6 and 6 to 7 respectively. It could be said that while the Marshal broiler group had a uniform growth rate irrespective of diet, the Harco pullets group were more sensitive to the experimental diets and their rate of growth changed as the nutritional content of the diet changed. The results of this findings showed that the rate of growth was significantly affected by inclusions of the different components of *Moringa* seeds products in chicken diets at certain stages of growth and development.

Broilers birds were generally heavier and bigger than the pullets and this can be attributed to the discrepancy in focus of the selection program in the respective breeds (North, 1984). In this study, the broilers were significantly heavier despite the fact that they were fed diets different from their normal standard diet and this further confirm the focus of breeders in broiler production which has mainly been on fast growth rate, while egg production traits have always been forefront on the priority of breeders in the line of production of laying birds (Fairfull *et al.*,1998). Mortality due to physiological, muscular skeletal and metabolic causes has resulted from the improvement of broilers for fast growth and as well, reproductive fitness has been negatively affected by selection for increased body weight (Siegel and Dunnington ,1985). Since selection in layers is largely for fitness traits, most of the problems plaguing broilers have been avoided. Due to the nature of important traits in layers, changes has been slower than in broilers as recorded in this experiment when they were both placed on the same experimental diet and the same management condition and this corresponding with the report of Fairfull *et al.*(1998).

This study suggested by conclusion that *Moringa* seed products can be fed to chicken but must be subjected to further processing before feeding so as to reduce the level of anti- nutritional factors present in *Moringa* seeds and to derive the maximum nutritional benefit required for the chicken. It also showed that inclusion of *Moringa oleifera* seed oil in the diet of chicken is advantageous and better than including *Moringa oleifera* whole seed and Seed cake because birds fed the conventional diet and diet with 4% *Moringa oleifera* seed oil were significantly heavier than others.

REFERENCES

Abass and Ahmed (2012),Use of Moringa oleifera seeds in Broiler diets and its effects on performance and carcass characteristics . International Journal of Applied Poultry Research. 1 (1) :1-4

Atteh, J.O. (2004).Theory and Practice of Poultry Production. Adlek Printers: 98-99.

Chambers, J.P. (1990_. Genetics of Growth and Meat Production in Chickens. In: Poultry Breeding and Genetics, Crawford, R.D. (Ed.). Elsevier Scientific Publishers, New York : 1123.

Compaore W.R., P.A. Nikiema, H.I.N. Bassole, A. Savadogo, J. Mouecoucou, D.j. Hounhouigan and S.A. Traore (2011). Chemical Composition and Anti- oxidative properties of seeds of *Moringa oleifera* and pulps of *Parkia biglobosa* and *Adansonia digitata* commonly used in food fortification in Burkina Faso. Curr Res J Biol.Sci, 3(1): 64-72.

Duncan, D.B (1955). Multiple Ranges and multiple F test Biometric , (11): 1-42.

Fairfull R.W., Millan L.M. and Mui W.M. (1998). Poultry breeding: "Progress and prospects or genetic improvement of egg and meat production" Agro breeding co., Nacogdoches, TX 75963-1940, U.S.A.

Maciejowski, J. and Zieba, J. (1982). Genetics and Animal Breeding, Part A. Biological and Genetic Foundations of Animal Breeding. Elsevier Scientific publishing co. Amsterdam-Oxford- NewYork. PWN-Polish Scientific.

Merck Veterinary Manual (MVM, 1986). Handbook of diagnostic Therapy and Disease Prevention and Control for the Veterinarian. 6th Edition: 40

North, O.M. (1984). Commercial chicken production manual 3rd Edition. AVT Publishing Company, California: 125-135.

NRC, 1994. National Research Council, Nutrient Requirement Table of poultry 9th edition Washington, D.C., National Academy Press.

Olaniyan O.M (2012). Nutrigenetic effects of *Moringa oleifera* Seed Meal on young broiler chickens B. Agric project, submitted to Department of Animal of Production University of Ilorin: 45-48.

Oludoyi I.O and Toye A.A. (2012): Effect of Early Feeding of *Moringa oleifera* Leaf Meal (0-4 weeks)

on Performance of Broiler and Pullet Chicks. Agrosearch. Vol. 12, No.2 (2012): 160 -17

Phillips I, Mark C, Tony C, Brad D G, Christian F R J, Nightingale C, Preston R and John W., (2004). Does the use of antibiotics in food animals pose a risk to human health? A critical review of published data. Journal of Antimicrobial Chemotherapy 53: 28-52.

Siegel P.B., and Dunnigton E.A. (1985). In "Poultry Genetics and Breeding" P. 59, Editors W.G. HW, J.H. Manson and D. Hewit, Longman, Br. Poul. Sci:1128-1132.

Sola-Ojo, F.E and Ayorinde, K.L (2010). Genetic evaluation of body weight in progenies of the Fulani Ecotype Chicken crossed with Hubbard Broiler strains. Proceedings 35th Annual Conference of Nigerian Society for Animal Production (NSAP), O.J. Babayemi,O.A. Abu and E.O. Ewuola. (eds.). Published by NSAP:12-14

Toye, A.A. Sola-Ojo, F.E., Olaniyan O.M and Ojo V.(2013). Nutrigenetic effect of *moringa oleifera* seed meal on the biological growth programme of young broiler chickens. *AGROSEARCH (Special Moringa (Edition)* Vol. 3. (1): 149- 163.