ANTILIPAEMIC EFFECT OF *Moringa oleifera* LEAF POWDER AS FEED ADDITIVE ON SERUM CHOLESTEROL FRACTIONS OF BROILER FINISHERS

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Abstract

The effects of using Moringa leaf powder (MLP) as additive on the differential cholesterol profile of broiler chickens at finisher phase was investigated in view of the scientific urge to find means of reducing fatty compounds in common meat products. One hundred and twenty, four weeks old Abor acre broilers were used for this experiment and allotted to four different treatment groups (T1-T4). The control group; T1 was without MLP inclusion , T2 with 0.40% MLM inclusion, T3 with 0.80% MLM inclusion and T4 with 0.40% Liver fit powder (LVP-commercial product). Each group was replicated thrice and allotted thirty birds in a completely randomized design. The experiment lasted eight weeks at the end of which blood samples were collected for the serum lipid fractions analysis. Parameters investigated were Total Cholesterol (TC), Triglycerides (TG), Low Density Lipoprotein (LDL), Very Low Density Lipoprotein (VLDL) and High Density Lipoprotein (HDL). Data generated were subjected to statistical analysis of variance. The results revealed that TC, TG, LDL and VLDL fractions of the serum cholesterol got reduced significantly ($p<0.05$) in birds on T3 and T4 while HDL got increased significantly with inclusion of MLP. These results suggest that MLP is hypocholesterolemic in nature. Consequently, MLP inclusions compared favourably well with LVP and therefore can be used for reducing bad lipid fractions of serum of broilers at finisher phase to reduce the risk of high fat related diseases among the consumers.

Introduction

It has been clinically proven that man requires a balanced diet in order to survive (Stadelman, 1994). One of the essential requirements for this balanced diet is protein, which is supplied by meat (Oyewole *et al.*, 2003). Broilers are white meat producing chickens that mature and ready for table after forty- two days of rearing with good management (Adesehinwa *et al.*, 2010).Their feed is concentrated with energy and protein content (Nworgu *et* al., 1999). Their growth pattern can be divided into two phases namely broiler starter which is between the first to fourth week, while the finisher is from fifth week to harvest (Oluyemi, 2010). Broiler starter requires high metabolic energy of about 3240kcalkg^{-1} and 24% of protein while finisher requires between 21%-24% protein and energy content of 2900-3000kcalkg^{-1} (Low, 2004).

Prolonged consumption of high energy diets by broiler chickens has been linked to fatty meat (Ayssiwede *et al.*, 2011) and this makes such meat to be undesirable for the fear of high dietary cholesterol levels on the part of the consumers to avoid escalated blood cholesterol levels which can predispose them to heart related diseases (Grundy, 1990).

The broiler chicken has a good feed conversion ratio ranging from 1:1.5kg to 1:2.5kg. This implies that for every 1.5 to 2.5kg of feed consumed, broilers would put on 1kg of meat. This efficiency is often affected by environmental, temperature, disease, nature of the feed, nutrient supplements and availability of water (Adeyemi, 2002). An animal needs sufficient levels of some vitamins, minerals, proteins and other nutrients for its physical development and well-being. Vitamins are usually given to the non-ruminant either as feed base premix or as oral therapy against vitamins deficiency or as immune suppressors during stressful conditions such as vaccination, transportation, weighing and so on (Portugaliza and Fernandez, 2012).

Several vegetables and plant species abound in Nigeria as condiments or spices in human diets or as supplementary feeds to livestock such as rabbits, poultry, swine and cattle. (Adeogun, 1994). Feed additives are non-nutritive materials which when added to the feed improves the performance of birds, but while absent from the feed does not constitute a deficiency situation, (Atteh, 2004). Additives used in poultry feeding includes those that aid feed intake like enzymes, antibiotics and grit, those that are used to produce more desirable consumer product like marigold petal, algae meal, ripe pawpaw, those that alter

metabolism like growth promoters. Other additives include antifungal agents, coccidiostats, antihelmintic drugs and at times tranquiling drugs. (Klasing and Leshchinsky, 2004).

As a result of high costs of these commercial additives, animal nutritionists are exploring locally available plants, shrubs and herbs as possible additives to reduce the cost of production. Among these plants is *Moringa oleifera*, which is a delicious tree or shrub and contain wealth of essential disease preventing nutrients. *Moringa oleifera,* or the horseradish tree, is a pan-tropical species (Anderson *et al.*, 2004). Over the past two decades, many reports have appeared in mainstream scientific journals describing its nutritional and medicinal properties. Its utility as a non-food product has also been extensively described, (e.g. lumber, charcoal, fencing, water clarification, lubricating oil). As with many reports of the nutritional or medicinal value of a natural product, there are an alarming number of purveyors of "healthful" food who are now promoting *M. oleifera* as a panacea. (Foidl *et al.*, 2001).

Moringa oleifera is of the family *Moringalae*, a native of Indian sub- continent and naturalize in tropical and sub- tropical area around the world. *Moringa oleifera* among other twelve varieties of *Moringa* species have been found to contain all essential amino acids, which is unusual for a plant source. It has also proven to be good cure for diseases like skin infection, intestinal worms, glandular swelling in countries like Malaysia, Guatemala, Pueto Rico, Philippines and so on (Fuglie, 2001).

Moringa dried leaf powder has been found to be rich in Calories (205.0%), Protein (27.1%), Carbohydrates (38.2%), Fiber (19.2%), Calcium (20.3%), Phosphorous (204.0%), Potassium (13.24.%), Copper (0.6%), Iron (28.2%), Sulphur (87.0%), Vitamin A-B carotene ((16.35%), Vitamin B1- Thiamine (2.6%), vitamin B2- riboflavin (20.5%), Vitamin B3- Nicotinic Acid (8.2%). Many of the listed vitamins, minerals and amino acids are very important for healthy diet and in regulation of blood cholesterol level. (Anderson *et al.*, 2004).

The fear of fatty meat and high dietary cholesterol which may be dangerous to human health is of great concern to broilers meat consumers. In order to reduce this fat intake and alleviate the fear heart and other related diseases, many commercial products reported to be liver enhancers have been introduced to the poultry feed industry with good results in respect of detoxification and hypocholesteromic effects. However, these products are not always available to the poultry farmers at affordable prices hence the need to investigate ways of reducing cholesterol level in meats with the use of organic materials that are locally available. Therefore, integration of *Moringa oleifera* as feed additive in broiler nutrition is a new dimension worth investigating.

Material and Methods

The experiment was carried out at the Poultry unit of the Teaching and Research farm of the faculty of Agriculture, Bowen University, Iwo in Osun State, Nigeria. *Moringa oleifera* leaves were harvested fresh from matured trees. The fresh leaves were sundried for about five days until complete dryness. Dried leaves were thoroughly pounded with wooden mortar. The resulting powder was stored in an airtight bottle and preserved under room temperature for subsequent usage as feed additive for the experimental birds.

One hundred and twenty, day old Abor Acre Broiler chicks purchased from a reputable farm in Ibadan, Oyo State, Nigeria were used for this investigation. At four weeks old of age, they were randomly allotted into treatment groups with three (3) replicates each. Thirty birds were allotted to each treatment group (10 birds per replicate) in a completely randomized design. The treatment groups (T1-T4) are; the control group, T1 without MLP inclusion , T2 with 0.40% MLP inclusion, T3 with 0.80% MLP inclusion and T4 with 0.40% Liver fit powder (LVP-commercial product).

The birds were reared on deep litter system. Routine management practices in term of medication and vaccination were strictly observed while feed and water were given to them *ad libitum.* At the end of the eighth week, blood samples were taken from the wing web veins of the experimental birds to determine the serum concentrations for total cholesterol, High-density lipoproteins (HDL), low- density lipoproteins (LDL), very low- density lipoproteins (VLDL) and triglyceride.

Data collected were subjected to statistical analysis using the Statistical Package for Social Science (SPSS 17 Evolution) and treatments were separated with Duncan's option of the same software.

Results and Discussion

Table 1 shows the gross compositions of broilers starter and finisher mash fed the experimental birds. The calculated values for the nutrients conformed to the recommendations for broilers at both phases (Onifade, 1997).

Table 2 shows the effects of *Moringa* leaf meal

inclusion on serum total cholesterol and differential lipids of the broilers. The mean concentration of the Total Cholesterol (TC), Triglyceride (TG), Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL), and Very Low Density Lipoprotein (VLDL) were significantly ($p<0.05$) different between the treatments. Although, no significant ($p>0.05$) difference was observed for TC between birds on T1 and T2, and also between T3 and T4, the pairs differed significantly ($p<0.05$) with the latter having the lower values. The same trend was observed for TG and LDL. Also, birds on T3 and T4 had higher values of HDL significantly ($p<0.05$) than those on T1 and T2. However, the VLDL of T1 and T2 were not significantly ($p>0.05$) different but differed from others significantly ($p<0.05$) with the least value of 70.45 mg/dl from T4. Meanwhile, birds on MLP and LVP additives had higher values of HDL. T3 (67.50 mg/dl) and T4 (mg/dl) were statistically the same for HDL values but they differed significantly from birds on T2 (40.42 mg/dl) and T1 (38.75 mg/dl).

The results of the TC and other lipid fractions in this experiment agree with the findings of Booth and Wickens (1998), Fahey *et al,* (2001) and Bennett *et* al., (2003) that *Moringa* leaves have antioxidant properties which is useful for the proper functioning of the liver in blood lipid regulations. Ghasi *et* al., (2000) established the fact that blood cholesterol got reduced significantly with the inclusion of crude extract of leaf of *Moringa oleifera* in high fat fed Wistar rats. Also, Olugbemi *et al.*, (2010) earlier reported that *Moringa* leaf meal is hypocholesterolemic in its actions on egg yolk and albumen when added to laying hens diets.

Conclusion

Incidence of arteriosclerosis and coronary heart disease has been linked to high dietary cholesterol levels derivable from the consumption of fatty meats. High fat deposition among broiler chickens is not desirable and the antilipaemic activities of *Moringa* leaf powder have been validated by the results of this investigation. Inclusion of MLP at 800g/ton (8.00%) as additive in the diets of broiler chickens at finisher phase will reduce the TC, LDL and VLDL which is a good indication of fat reduction for safe consumption.

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Table 1: Gross composition of the experimental diets

Ingredients (%)	Treatments T1	T2	T3	T4
Maize	58.00	58.00	58.00	58.00
Wheat offal	11.00	11.00	11.00	11.00
Palm kernel cake	7.50	7.50	7.50	7.50
Full fat soya	10.00	10.00	10.00	10.00
Groundnut cake	8.50	8.50	8.50	8.50
Fish meal	0.50	0.50	0.50	0.50
Oyster shell	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00
Broilers premix*	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Lysine	0.05	0.05	0.05	0.05
Methionine	0.05	0.05	0.05	0.05
Moringa leaf Powder	0.00	0.04	0.08	0.00
Liver fit Powder	0.00	0.00	0.00	0.04
Calculated values:				
Metabolizable Energy Kcalkg^{-1}	2800.50	2800.50	2800.50	2800.50
Crude Protein (%)	22.50	22.50	22.50	22.50
Crude fibre (%)	3.62	3.62	3.62	3.62
Ether Extract (%)	5.80	5.80	5.80	5.80

**Premix to provide the following per kg of meal: Vitamin A – 500mg; Vitamin D3 – 1200mg; Vitamin E – 11mg; Vitamin k3 – 2mg, Riboflavin – 20mg; Nicotinic acid – 10mg; Panthothenic acid- 7mg; Cobalamin – 0.80mg; Manganese – 80mg; Chlorine – 900mg; Folic acid – 1.5mg; Biotin – 1.5mg; Copper – 2mg; Zinc – 5mg; Cobalt – 1.2mg and Selenium – 0.1mg.*

Table 2: Effect of *Moringa* leaf Powder as feed additive on differential serum lipid of Broiler chickens at finisher phase

Parameters (mg/dl)	Treatments T1	T2	T3	T4	SEM
Total Cholesterol	153.53^{a}	148.65^{a}	125.42^{b}	120.05^{b}	8.00
Triglycerides	143.63^{a}	142.15^{a}	130.05^{b}	128.65^{b}	7.50
Low density lipoprotein	72.51^{a}	70.38^{a}	58.50^{b}	49.50^{c}	5.50
High density lipoprotein	38.75^{b}	40.42^{b}	67.50^{a}	68.40^{a}	5.00
Very low density lipoprotein	90.55^{a}	90.00^{a}	86.40^{b}	70.45^{c}	6.50