BERKELEY PUBLICATION
AND RESEARCH INTERNATIONAL
09.30.2020
Journal of Med., Biological and Pharm. Sci. Vol. 13 No. 3

PHYTOCHEMICAL CONSTITUENTS AND ANTIBIOTIC EFFECTS OF *Moringa Oliefera* SEED POWDER ON THE GROWTH PERFORMANCE OF BROILER CHICKENS

[1]YAHAYA, U. F., [2]MAIKANO, S., [3]POPOOLA, A. S., [4]OKECHALU, S. O., [5]LIKITA, M. S., [6]ADEMOLA, T. O., [7]LAPKAT, L. G., AND [8]A. BAKO

[1]Agricultural Extension, Federal College Forestry Afaka, Kaduna State. [2]Forestry Technology, Federal College Forestry Afaka, Kaduna State. [3]Forestry Technology Department, Federal College Forestry, Jos Plateau State. [4,7&8]Horticulture and Landscape Technology Department, Federal College Forestry Afaka, Kaduna State. [5]Basic Science Department, Federal College Forestry Afaka, Kaduna State. [6]Agricultural Technology Department, Federal College Forestry Afaka, Kaduna State.

ABSTRACT

Antibiotics are administered in poultry drinking water for prevention or control of bacterial contamination and to promote growth performance and health of birds. However, these antibiotics have negative effects and this has led to the search for safe and natural alternatives like Moringa Oleifera to reduce continuous use of antibiotics in poultry to promote health and nutrition. In this study, effects of oral administration of different levels of Moringa Oleifera seed powder on the growth performance of broiler chickens were evaluated in comparison with antibiotics. Seeds were collected from Bauchi State, dried and crushed into

Introduction:

Poultry meat and its products have a vast consumer market and are making significant contribution to the supply of quality protein, vitamin and minerals (Mothershaw *et al.,* 2009). Chicken accounts for more than 90% of the total poultry population of the world (Biswas *et al.,* 2011). The major paramentes considered in the assessment of meat quality are appearance, juiciness, tenderness and flavor. The presence of dispose tissue as marbling fat between muscle fibre bundles can weaken increases juiciness,

ISSN: 1211-4401

powder. Physiochemical constituents such as polysaccharide, phenol, flavonoides, and tannins were analysed before administration. In addition, a total number of sixty (60) day- old broiler chicks were purchased and divided at random into five treatment (T_1, T_2 T_3 T_4 and T_5) and total number of twelve (12) chicks par treatment with three (3) replicate in each. T_1 serves as the control, T_2 second control with only vaccine (Gumboro and Lasota), T_3 (5g of Moringa Oleifera seed powder), T_4 (10g of Moringa Oleifera seed powder) and T_5 (5g of Amprocine solable-antibiotics). The experiment lasted for eight (8) weeks. Weight gain or loss, feed intake and feed conversion ratio, water intake of the chicken were assessed weekly during the growing stage. A total of 4 chicks were randomly selected for the determination of weight liver, heart, gizzard, spleen and body part / carcass weight, data collected were analysed using descriptive statistic and analysis of variance (ANOVA) and reported as mean standard deviation. However, the result obtain shows that there is no significant difference in feed intake (T_1 =4.11, T_2 = 4.20, T_3 = 4.20, T_4 = 3.90 and T_5 = 4.20) and water intake (T_1 = 15.20, T_2 = 15.88, T_3 = 14.63, T_4 = 13.17 and T_5 = 16.04) intake for the five treatment. Also there is significant difference in weight gain (T_1 = 1.638, T_2 = 1.466, T_3 = 1.670, T_4 = 1.879 and T_5 = 1.504) and mortality (T_1 = 8.33, T_2 = 0.00, T_3 = 8.33, T_4 = 16.66 and T_5 = 0.00) for all treatment. It can be concluded that Moringa Oleifera seed powder incorporated with 10g in water can improve growth performance of boiler chickens.

Keywords: *Moringa, Growth Performance, Phytochemical, antibiotics, Broiler Chickens.*

tenderness, and flavour of the meat (Muhenje *et al.,* 2008a). At buying point, appearance is the major parameter that influences purchase, selection and initial evaluation of meat quality. These desirable meat parameters tend to be negatively affected by lipid peroxidation. Besides health concerns to the consumer, lipid peroxidation is also a major cause of meat quality deterioration, affecting colour, flavor, texture and nutritional value (Giannenas *et al.,* 2009). Antioxidants have been reported

to be efficient in diminishing lipid oxidation of meat. However the use of natural antioxidants to stabilize meat has gained mush attention from consumers because they are considered to be safer than synthetic antioxidants (Jung *el al.,* 2010). Such as butlated hydrosytoluene (BHT) and tertiary butyl hydroquinone (TBHQ). Natural antioxidants also have the ability to increase the antioxidants capacity of the plasmas and reduce the risk of certain diseases such as cancer, stroke and cardiovascular diseases (Chanda and Dave, 2009). It has also been reported that theses natural antioxidants, especially of plant source, have greater application potential for consumer's acceptability, palatability, stability and shelf-life of meat produce (Jung *et al.,* 2010). One such plant with a potential to be used as an antioxidant is moringa (*Moringa oleifera*).

Moringa oleifera (LAM) known as drum stick is a medium sized soft wood tress of about 10m height belonging to the family moringaceae (Adedian *et al;* 2003). Native to south Asia. It is considered to have its origin in Himalayan Mountains and grows naturally (Dogra *et al,* 1995). The tress has been found growing in ara receiving less than 400mm mean annual rainfall. It is mow cultivated in the whole tropics, including the northern region of Nigeria. The tress plant *Moringa* has been discovered to possess many valuable properties (Narayana and Parvathi, 2004). The tree is not a nitrogen-fixing plant but it fruits, flower and leaves contains 5-10% protein excellent for production of biogas. Several studies demonstrate that significant proportion of traditional fordder can be replaced with *Moringa* leaf. They are well suited for use in alley cropping (Becker, 1995). Meanwhile the plant is commonly used as living support for fencing in the communities. The seed is often used to purify dirty of cloudy drinking water (Von-Maydell, 1996). The seed cake is used a protein-rich plant fertilize. It has also been reported that juice extract from the leaves can be used to make a folar nutrients capable of increasing crop yield up to 30% (Ronse *et al;* 1998). *Moringa oleifera* is adapted to a wide range of soil types but does best well drained loamy soil (Doerr and Camerom, 2005). When cultivated extensively and then ploughed into the soil, *Moringa oleifera* can act as the natural fertilizer for other crops (Mehta, *et al.,* 2003). However the cultivation of *Moringa oleifera* in large quantity due to

increase in awareness and demand for its leaves is still a very slow phase in the region. This is as result of the scanty knowledge on the management of the species of juvenile stage as it affect biomass production and fertilizer application .

Over several year, antibiotics are widely used in chicken for therapeutic use to treat diseases, prophylactic use to prevent infections or as growth promoters to improve feed efficiency and performance. But resistance to antibiotics associated with the use of antibiotics animals leads to the risk of transfer of antibiotic-resistant genes to human pathogens (Gould, 2008). Also there is the issue of reduced efficacy of antibiotic therapy in chicken infected with resistant bacteria; the large use of oral medication in chicken may increase the incidence of unacceptable residues in eggs or meat. Such residues may be reduced by establishment and adhering to withdrawal periods for eggs or before slaughtering. According to the World Health Organization (WHO). The use of antimicrobials in food animals is a public health issue (WHO), 2008). As alternatives to the use of antibiotics as growth promoters, probiotics were developed and incorporated in poultry feed as a potential tool for reducing intestinal contamination with disease-causing and food-borne bacteria. Recently, a lot interests were focused on investigation for alternatives to antibiotic growth promoters. Various plants extracts especially essential oils have been studied for their antimicrobial abilities (Griggs and Jacob, 2005). A review of available literature shows that *Lecena Leucocephala, Gliricidia sepium, Sesbania sesban* and *Manihot esculenta* have been widely used in feeding non-ruminant and especially poultry resulting in improvement of their productivity. However, plants may contain some nutrients of anti-nutritive factors that might affect positively or negatively production parameters. Thus, any plant that can be used for its abilities to improve productivity should be investigated in order order to determine the limits of its incorporation in animal feed. In tropical regions, *Moringa Oleifera* leaves are widely used traditionally for its antimicrobial abilities (Suarez *et al.,* 2005) and its pharmacological properties (mehta *et al.,* 2003). This plant is known to contain 23% of crude protein 12 MJ/Kg of metabolizable energy and to posses 79.7% of digestibility (Becker, 1995) it also contents

sufficient quantities of carotene, ascorbic acid, iron methionine and cystine (Makkar and Becker, 1996). Apart from these nutritional constituents. *Moringa* leaves are known to contain phenols, anti-nutritional factors such as tannins, saponin, phytate and oxalate (Gupta *et al.,* 1989). Few studies have showed the effects of *Moringa oleifera* leaves on the improving of ruminant farming (Gadzirayi *et al.,* 2012) and poultry performance. However chemical compositoion of plants may be affected by climatic, seasonal and processing methods (Dei *et al., 2007).*

Moringa is rich source of antioxizant. It has been reported that aqueous extract of leaf fruits and seed of *Moringa* act as antioxidant (Price, 2000*).* During a study reporting antioxidant property if freeze dried *moringa* leaves from different extraction procedures, it was found that methanol and ethanol extract of Indian origin *moringa* have the highest antioxidant activity with 65.1 and 66.8% respectively (Siddhuraju and Becker, 2003). It was also reported that the major broactive compounds of phenotics such as querceting and kaemferol are responsible for antioxidant activity(Bajpai *et al.,* 2005. Siddhuraju and Beker, 2003). During another study, Quecetin and Kaempfrol have shown good antioxidant activity on hepatocyte growth factor (HGF)induce met phosphrylation with IC 50 value for 12 and 6pmk respectively (Lea 2010) another recent study comparing palm oil with *moringa* seed for their antioxidant potentials found out that *moringa* seed are superiors for radical scavenging (Siddhuraju and Beker, 2003). The objectives of this study are to assess the photochemical of *Moringa Oleifera* seed powder, and investigate the effects of the oral administration of different levels of *Moringa Oleifera* seed powder in chicken water on production performance

MATERIALS METHODS

Area of study

The experiment was carried out in biology Laboratory of Federal College of Forestry Jos, Plateau State, Nigeria. Jos is located in Northern Guinea savannah, between latitude 8^0 and 30′ and 10^0. 10 N and longitude 8^0 20’ and 9^0 30’ E. It has an average elevation of about 1250m above sea level and stands at a height of about 600m above the surrounding plains. The

average temperature in Jos ranges between 21^{0}C to 25^{0}C. The climate of the state is cool due to high altitude. The mean annual rainfall is 1260mm. The relative humidity increases from May to October and decreases gradually from November to April. Jos (Olowolafe, 2002).

METHODS

Seeds Preparation

Seeds of *Moringa Oleifera* used for this study were air-dried at ambient temperature (25^{o}c) for seven days. The dried seeds were crushed into powder form with ceramic mortar and pistol. The powder obtained was wighted before administration. Samples of powdered seed was analyzed at National Vetinary Research Institute (NVRI), Vom Plateau State for flovonoid, phenols, polysaccharides and tannins levels determination before administration.

Field Experimentation

The chicks were brood at the College brooder inside a carton for the first 4 weeks, fed with broiler starter feed which was given water at ad-libitum. The seed powdered was administer into the chickens drinking water and taking orally by the chicks also ad-libitum. After the first four week the feed were changed from starter feed to finisher feed. The system used ingraining the chickens was deep liter system. A total number of 60 day-old broiler chicks were used. The chicks were divided into five groups, each group representing a treatment with three replicates, each replicates contains four chicks, making a total number of twelve chicks in each treatment and sixty in the whole experimental set-up. Prior to the different dosage for *Moringa Oleifera* seed powder administration, the chicks were weighted to ascertain their initial body weight. Gain or loss for eight weeks. At the end of the experiment, four chickens were sampled randomly from each treatment and slaughtered so as to determine the weights of liver, heart, gizzard, spleen, carcass/body par. Also, feed intake and feed conversion ratio were determined for each treatment. Chick body weights and organ absolute weight were used to determine organ absolute weights were used to determine organ relative weight as:

$$\text{Organ relative weights} = \frac{organ\ absolute\ weight}{chick\ body\ weight} x\ 100$$

Experimental Design and Layout.

The experiment was laid out on a Completely Randomized design, comprises of five treatments and three replicates. Each replicated contains four chicks, making a total number of twelve chicks in a treatment and sixty in the whole experimental set-up. T_1 = Control, T_2 = Chickens with vaccine only, T_3 = Chickens with 5g of *moringa oliefera* dosage per litre of water, T_4 = Chickens with 10g of *moringa oliefera* dosage per litre of water, T_5 = Chickens with 5g of recommended dosage synthetic antibiotics (amprocine soluble), R_1, R_2, R_3, are the replicates.

Parameters that were assessed

The following growth parameters were assessed; Weight gain or loss of the whole chickens while growing, Feed intake and feed conservation ratio, Organ Relative weight (Liver, heart, gizzard Spleen) of the chicken after they are being slaughtered, Body parts/carcass weight: (head, neck, shank, wings, breast, backbone, ribcage, thigh and drum stick)

Data collection and statistical analysis

The daily average feed intake, weight gain, feed conversion ratio and daily water intake were determined as described by Ogbe *et. al.,* (2009). Organ and carcass analysis was also determined at the end of experiment (8 weeks). All data collected were analysed using descriptive statistic of variance (ANOVA) as described by Olawuyi (1996). Result were reported as mean standard deviation.

RESULTS AND DISCUSSION

Results

The result of this findings are presented as follows

Table 1: Phytochemical composition of *Moringa oleifera* seeds

Components	Level of occurrence
Flavonoids	++

ISSN: 1211-4401

Phenols	-
Polysaccharides	++
Tannins	+++

Keys; + = present; ++=More present;+++ =Highly present;-= Absent
The Phytochemical result revealed that Falvonoids has (more present), Phenol (absent), Polysaccharides (more absent) and Tannins was (highly present).

Table 2; Average Feed Intake and Growth Performance of Broiler Chickens Administered With Moringa Oleifera Seed Powder and Antibiotics (Amprocine Salable)

PARAMETER	Group mean weight and organ: body weight ratio (%)					
	T1	T2	T3	T4	T5	LOS
Initial weight (kg)	0.042±0.003	0.044±0.001	0.040±0.002	0.041±0.001	0.046±0.004	NS
Final weight (kg)	1.68±0.07	1.51±0.02	1.71±0.03	1.92±0.02	1.55±0.04	*
Weight gain (kg)	1.68±0.02	1.466±0.03	1.670±0.002	1.879±0.03	1.504±0.01	NS
Feed intake	4.11±0.02	4.20±0.01	4.20±0.03	3.90±0.03	4.20±0.01	NS
Feed conversion ratio (FCR)	2.56±0.09	2.50±0.03	2.55±0.02	2.07±0.01	2.27±0.03	*
Water intake (L)	15.2±0.15	15.88±0.09	14.63±0.06	14.63±0.06	16.04±0.007	NS
Mortality (%)	8.33±0.58	0.00±0.00	8.33±1.15	8.33±1.15	0.00±0.00	*

Value represent mean ± standard deviation (SD) of duplicate result asterisk (*)= indicate significant difference at 5% level (P>0.05) NS= not significant, LOS = level of significant, group T1 = represent control group T2 = represent second control Group T3= represent broiler chicks administered with 5g at moringa oleifera seed poweder, group T4 represent broiler chicks administered with 10g of moringa oleifera seed powder and group T5 represent broiler chicks with 5g of antibiotics (amprocine solable) only.

Feed intake and growth performance of broiler chickens

Table 2 presents the feed intake and growth performance of the chickens under different treatments on site. The initial weight of chickens ranges from 0.040-0.046kg. The final weight gain of 1.466kg while the highest was T4 (1.879kg). Feed intake falls between 3.90-4.20kg. Feed conversion ranges between 2.05- 2.60 across all treatment, while water intake was

between 13 – 16.5liters. However, the ANOVA result of broiler chickens were not significantly different (P‹ 0.05) in all the treatments, while there was significant difference in final weight and feed conversion ration across the treatments.

Table 3; Carcass and body weight (%) of broiler chickens administered with moringa oleifera seed powder and antibiotics (Amprocline Solable)

PARAMETER	Group mean weight and organ: body weight ratio (%)					
	T1	T2	T3	T4	T5	LOS
Pre-slaughter weight (kg)	1.60±0.04	1.68±0.03	1.65±0.01	1.88±0.02	1.85±0.02	NS
Dressed weight (kg)	1.38±0.04	1.43±0.01	145±0.01	1.65±0.01	1.60±0.02	NS
Dressing percentage (kg)	86.25±0.6	85.12±0.2	87.88±0.2	87.77±0.17	86.49±0.19	*
Carcass par/body weight (%)						
Head	1.82±0.17	1.75±0.05	2.16±0.21	2.27±0.25	2.35±0.27	NS
Neck	2.27±0.25	3.51±0.26	3.88±0.32	3.79±0.40	3.52±0.28	NS
Breast	10.00±0.02	10.96±0.17	11.21±0.23	10.99±0.01	11.33±0.03	*
Backbone and ribcage	3.64±0.01	5.26±0.03	5.60±0.05	4.55±0.05	5.47±0.001	NS
Thigh and drumstick	6.36±0.01	7.02±0.08	7.33±0.14	6.82±0.08	8.20±0.14	*
Wings	154±0.09	1.18±0.02	1020±0.03	1.37±0.02	1.30±0.06	NS
Shanks	2.27±0.02	2.19±0.02	2016±0.01	2.27±0.02	2.35±0.06	NS
Organs body weight (%)						
Heart	0.16±0.02	0.12±0.01	0.14±0.04	0.14±0.02	0.13±0.01	NS
Liver	0.63±0.06	0.59±0.06	0.61±0.02	0.56±0.03	0.57±0.02	*
Gizzard	0.91±0.01	0.84±0.05	0.95±0.03	0.62±0.10	0.87±0.10	*
Spleen	0.03±0.10	0.03±0.00	0.02±0.00	0.02±0.01	0.02±0.01	NS

Value represent mean ± standard deviation (SD) of duplicate result asterisk (*)= indicate significant difference at 5% level (P>0.05) NS= not significant LOS = level of significant, group T1 = represent control group T2 = represent second control Group T3= represent broiler chicks administered with 5g at moringa oleifera seed powder, group T4 represent broiler chicks administered with 10g of moringa oleifera seed powder and group T5 represent broiler chicks with 5g of antibiotics (amprocine solable).

Generally, the carcass and organ weight did not show any appreciable variation (Table 3). However, the cut carcass parts of broilers, the breath in treatments 3 (11.21) and 5 (11.33) appear to be slightly higher than

those recorded in others. The thigh and drumstick parts of birds in T5 (8.20) was higher than others. These difference may be due to lack of uniformity in the growth of the broilers and not necessarily as a result of the plant extract. The ANOVA results of this table shows drumstick, liver and Gizzard, while pre-slaughter weight, head, neck, backbone and ribcage, wings, shanks, heart and spleen of the broilers show no significant difference across treatments.

Discussion

Generally, the result obtained from this study showed that the plants products (*Moringa* seeds) contained valuable amounts of crude protein, fatty acids and minerals, which are nutritional requirement of poultry (broilers). Anti-nutrients present in it were high. These anti-nutrients or phytochemicals are non-nutritive were reported to have pharmacologically active effects (Soetan and Oyewole, 2009). These phyto-constituents were reported as antibiotic principles of plants (Ajayi *et al.,* 2011). They offer benefits (prevent cell damage and fight infections) in plants and animals when ingested by them in food. Certain phytochemicals have anit-nutritional properties (side effects), when ingested in excess. High dietary tannins were reported to depress the digestibility of feed by affecting (or suppressing) the activity of the enzymes involved in carbohydrate and protein breakdown (Nsahlai *et al.,* 2011).

In this study, the levels of anti-nutrients and the phytochemicals were higher in *Moringa* seeds (Table 1). This may be responsible for the low weight gain of broilers that were administered aqueous extract from *Moringa* seeds. There is need to further adequately process *Moringa* seeds by heating or boiling in hot water to poultry remove the anti-nutritional factors for proper utilization of this plants products in bind with protein and minerals to make them unavailable for utilization or conversion into body tissues development. Essential nutrients particularly proteins and minerals are required for normal growth, activities of muscles and skeletal development. Deficiency of these nutrients and minerals are known to affect the performance and health of poultry (Merck, 2005). The toxic effects of anti-nutrients could be reduced by proper food processing such as soaking or boiling of plant materials in water (Enechi and Odunwodu, 2003). It also improves utilization in terms of feed intake and protein digestibility (Doer, 2007). This study corroborates the report of Fulgie (1999) on high performance of birds administered with *Moringa oleifera* seed diet.

Conclusion

In conclusion 10g of moringa oleifera seed powder can serve as an alternative to the use of antibiotic as growth promoter for broiler chicken because of the important compound of micronutrients such as protein, energy. Amino acid, vitamins and minerals and also antinutritive factors such as polysaccharides, tannins, Flavonoids, and phenol as reported in this study.

Recommendation

Moringa oleifera seed product can be administered to chicken but must be subjected to further processing before administration so as to reduce the level of anti-nutritional factors present in the seed to drive the maximum nutritional benefit require for the chickens to grow well.

REFERENCES

Adediran, N. H. Von Carlowitz P. G. Greger V. W. Reinier E. M. K. (2003). Multipurpose tree and shrubs database. An information and decision support systemusers manual version 1.0 ICRAF. Nairobi Kenya.

Ajayi, I. A, Ajibade R A. (2011). Preliminary phytochemical analysis of some plant Seeds. RES. J. Chem. Sci., 1(13):58-62.

Akinyeye, R. O, Oluwadunsi, A., Omoyeni, A. (2010). Proximate, mineral, anti-nutrient and phytochemical screening and amino acid composition of the leaves of pterpcarpus mildbraedi Harms, Electr. J. Environ. Agric. Food Chem., 10(1): 1848-1857.

Biswas A, Ahmed M, Bharti VK, Singh SB (2011). Effect of antioxidants on physio-biochemical and hematological parameters in broiler chicken at high altitude. AsianAust. J. Anim. Sci. 24:246:249.

Becker, K. 1995. Studies on utilization of Moringa oleifera leaves as animal feed institute for animal production in the tropics and subtropics Vol. 480. University of Hogengeim stuttgard P. 15.

Chanda, S., and Dave, R. (2009). In vitro models for antioxidant activity evaluation and some medicinal plants possessing antioxidant propertiesl: An overview Afr. J. Microb. Res 3:981-996

Cobb- Vantress 2008. Broiler management guide Sainbury, D.W.B. 1988Broiler chicken In management and welfare of farm animals the UFAW handbook: pp. 221232 London Balliere Tindall.

Die H.K, S.P. Rose and A.M. Mackenzie, 2007, shea nut (vittelaria Paradoxa) meal as a feed ingredient for poultry worlds poult, sci;j. 63:611-624.

Doer B. Cameron L. (2005) Moringa leaf powder Echo technical note www.echoner.org.

Dorga P.D Singh B.P Tandon S. (1995). Vitatamin Content in moringa leaf power. Echo Technical Note ww.echohnet.org.

Enechi OC, Odonwodu I (2003). An assessment of the phytochemical and nutrient composition of the pulverized root of Cissus quadrangularis. Bioresearch, 1:6363-68.

Fuglie L.D. (1999). Moringa national nutrition for the tropics. Dakar Church World Service.

Lea, Micheal (2010). Boremediation of turbid, surface water using seed extact from moringa oleifera Iam (Drum stick tree doi. 10. 1002)9780 0471729259

Giannenas I, Pappas IIS, Mavridis S, Kontopidis G, Skoufos J, Kyriazakis I (2009) Performance and antioxidant status of broiler chickens supplemented with dried mushrooms (Agaricus Bisporus) in their diet . Poult. Sci,. 89:303-311.

Gadzirayi, C.T.B., Masamha, J.F. Munanga and S. Washya, 2012 performance of broilers Chickens fed on Mature moringa oleifera leaf meal as protein supplement to soya bean meal ht.J.poult. Sci 11:54-10

Gould, I. M 2008. Antibiotics polices to control hospital acquired infection J. Antimicrobial chemotherapy , 61:763-765

Grigga J.P. and Jacob 2005 alternative to antibiotics for organic poultry production N. J. April Poultry Res., 14 750-756

Gupta K.B G.K Barat, D. S Wagle and H.K.L Chawla, 1989 nutrients contents and antinutritional factors in conventional and non-conventional leafy vegetables food chern; 31:105-106.

Jung S, Choe J, Kim B, Yum H, Krut ZA, Jo C (2010) Effect of dietary mixture of gallic acid and linoleic acid on antixidative potential and quality of breast meet from broiler meat Sci. 86:520-526.

Merck (2005). Mineral deficiencies. The Merck Veterinary Mannual, Ninth Edition. Pulblished by Merck and Co., Inc., Whitehouse Station, N.J., USA, Pp. 2322-2330

Mothershaw AS, Gaffer T, Kadim I, Guizani N, Al-Amri I, Mahgoub O, Al-Bahry S (2009). Quality characteristics of broiler chickens meat on salt at different temperature. It. J. Food Prop. 12:681-690

Muchenje V, Dzama K, Chimonyo M, Raats JG, Hugo A, Strydom PE (2008a) Sensory evaluation and its physical meat attributes of beef from Nguni and Bonsmara steers raised on natural pasture. Animal 2:1700-1706.

Makker R. H. and K becker, 1996. Nutritional value and antinutritional component of whole and ethanol extracted Moringa oleifra Leaves. Anim feed sci. Technol, 63:211 -228

Mehta, L. K., R Balaraman. A.H Amin, P.A Bafna and O.D. Gulati S, 2003. Effect of fruit of Moringa oleifera on lipid profile of normal and hyperchclestrilemic rabbits . Ethnopharmacol, 86: 191-195

Narayana L. L., and Parvathi A. (2004) Chemotheapy of moringa J. India Bof. 57:10-17 Odee D. (1998) Forest biotechnology research in dry lands of Kenya the development Moringa species Dry land Biodiversity.

Nsahlai IV. Fon FiN, Basha NAD (2011) The effect of tannin with and without polyethene glocol on in vitro gas production and microbial activity . South Afri. J. Anim. Scl., 41(4):337-344.

Ogbe AO, Atawodi SE, Abdu PA Sannusi A, Itado AE (2009) Changes in weight, faecl oocyst count and packed cell volume of Eimeria tenella-infected broilers treated eith a wild mushroom (Ganoderma lucidum) aqueous extract. J. South Afri Vet. Assoc., 80:97-102.

Olawuyi J. F. (1996). Biostatistics: A foundation course in health science. 1st Edition. University College Hospital, Published by Tunji Albi Printing Co. Total Garden, Ibadan, Nigeria, pp. 1-221.

Ronse Decraene, L.P., DE J and smets, E.F., 1998 Floral development and antomy of morinfa oleifra (Moringaceae) : What is the evidence for a capparalean or sapindalean Afinity? Annals of Botany 8293):273-284.

Siddhuraju, P. and Becker. K 2003 Antioxidant properties of various solvent extract of total phenolic constituent form three different agro-climatic regions of drumstic tree food chem...., 15: 2144-2155

Suarez, M.m Haeni, S. Canarethi F. Fisch, P. Chondon woski C, Servis O. Michelin, R. Frietag, P Mereillon and N Meer Mod 2005. Structure function characterization and optimization of a plant dried antibacterial peptide. Antibacterial agents chemography, 99:3847-3857

WHO, 2008 Antimicrobial resistance World health organization media centre. Fact sheet No 194 http://www.Who.int/Media centre/fact sheets/fs