LIVESTOCK EXTENSION IMPERATIVES OF UTILIZING MATURED BROILER BEAK AS COMPOSITE FEED RESOURCE

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ABSTRACT

A study evaluated the livestock extension imperatives of utilization of matured broiler beak as composite feed resource. The study adopted both laboratory and qualitative research procedures to generate information based on specific objectives of the study. The proximate analysis of the nutritional composition of matured beak was investigated. Awareness of the feed millers on the utilization potentials of broiler beak by-product for macro elements and the livestock nutritional extension imperatives for the matured broiler as composite feed resources were analysed. Fifty(50) Amogbyn day-old birds reared to eight weeks with average mean weights between 2.75kg and 3.30kg were used for this research under good management practices. These matured broilers were slaughtered and their beaks extracted, processed and digested to obtain digesta which was read with Atomic Absorption Spectrophotometer (AAS;BUCK 200A Model). Calcium absorption mode was read at a wavelength of 422.7NM while Mg absorption was read at wavelength of 362.4NM. Ca concentration range of 0.656-0.924 also varied from Magnesium concentration range of 0.066-0.269. The study revealed that there is a marked variability in the concentration of macro-minerals in the beaks of the same species. However, 36% of the study population was relatively high in concentration of Calcium and Magnesium. Despite their seeming small concentrations in the beaks, Calcium and Magnesium can still be used at composite level to replace limestone in alternative feed source for minerals. Therefore, the use of beak is promising and further investigation into its composite feed resource status for other macro minerals is recommended

Keywords: Macro-Minerals, Beak, Broilers, By-Products, Feed, Resource.

INTRODUCTION

Broilers are chickens of either sex usually reared for meat. They have tender meat, smooth-textured skin and flexible breastbone and cartilage(Wong,1995). They have large body size and are efficient converters of rations to edible meat (Shane, 2006; Daghir, 2008; Onimisi et al, 2012). Broilers attain a live weight of about 1.5 to 3.0kg under 8 to 10 weeks of age depending on feed quantity, quality, health and other management practices (Asaniyan et al 2007; Ojedapo et al, 2009; Odukoya et al, 2014). Meat from broiler provides quality animal proteins of high biological value, low fat and cholesterol content (Sonaiya et al, 1990) as well as minerals and vitamins required for development and growth of man (Holness, 2005; Wattanchart, 2008; Kehinde et al, 2012 and Owen et al, 2013). Further reports on benefits of broiler meat by Akanni et al (2010), Amao(2010) and Eko et al (2014) revealed that the meat is consumed across several cultural barriers and it is devoid of religious and discriminatory taboos against it consumptions (Ahemen and Wuanor, 2010). As noted by Yalcin et al (2001) and Olaiya et al (2014), broilers are relatively free from some pathological, ecological and economic constraints that affect commercial production and other classes of livestock.In addition, broiler production has become a dependable source of employment, income generation and poverty reduction among its operators (Aphunu and Akpobosa, 2009; Nworgu

et al, 2012). According to Abubakar et al (2009), Onimisi et al (2012) and Abdullahi et al (2014), broiler keeping has offered appreciative and quicker return on investment and highest turnover rate than any other agribusiness if properly managed. Other considerations for broiler business as noted by Owen et al (2013) are short generation intervals, fast growth rate, small space requirement, lower age at maturity, high meat yield at slaughter and ease of management. The success of broiler ventures also depends on birds having good nutrition, health, efficient management, capital investment and technical skills (CDI, 1996; Oluyemi and Roberts, 2000).

The enormous socioeconomics benefits from broiler business notwithstanding; the sector is facing several challenges chiefly which are poor quality of feed ingredients, high cost of feed due to scarcity, poor quality chicks and disease infestation (Adeyemo and Onikoyi, 2012). Within the broiler subsector industry, feed cost accounts for 60-70% of the total cost of production (Adesua et al, 2010 and Balogun et al, 2014). The ultimate goal of broiler industry is the attainment of sustainable production with minimum cost of production and maximum returns. This has not been achieved due to the prohibitive cost of feed ingredients. The high cost of feed ingredient, particularly the protein concentrates has been a major problem of poultry production in developing countries today apart from incidence of diseases (Aguihe, 2012). Therefore, the urgent need to reduce the high cost of feed ingredients has prompted nutritionists, farmers and other stakeholders in the poultry industry to shift research direction to alternative feedstuffs which are locally available and affordable to the end users. One of such ingredients is the locally sourced macro-mineral nutrients. Though minerals contribute only 10% of the total cost of feed, the effects of using sub-standard or less potent minerals on production could easily be felt in production indices of birds (Ogunwole et al, 2012). According to Lawrence-Azua et al (2012), studies have been reported on the use of cheaper and unconventional feedstuffs as partial or complete replacement for the expensive ones in the diets of broiler birds towards reducing the cost of production. For a diet to be balanced, it must supply the essential nutrients not only in sufficient quality but also in the right proportions. Diets should therefore be formulated to promote the desired intake of all nutrients and to improve growth rate at reasonable cost (Ijaiya et al, 2009). Despite the present contributions of the poultry industry to Nigerian economy, the sub-sector is facing challenges of future growth. Any attempt to improve commercial broiler and increase its efficiency therefore needs to focus on better utilization of alternative feed sources.Research on the alternative sources of feed ingredients has been more concerned with energy and protein stuffs while little effort has been made on alternative sources of aforementioned macro minerals (Alu et al, 2010). Although bone meal, limestone and of recent, Oyster shells have been veritable source of Calcium(Ca) and Magnesium(Mg) in broiler feeds, there are other waste products from broiler processing such as the beaks (the horny structure serving as mouth to birds) which can be utilized as source of Ca and Mg . This is because in large scale broiler production, the enormous quantity of beaks discarded is enough to be processed and used at composite level to limestone in particular, to reduce cost and health hazards, even as it involves less technical expertise and financial resources. This study was, thus, conducted to evaluate the macro mineral concentrations in the beaks and their utilization as feed resources. Therefore, the proximate analysis of the nutritional composition of matured beak was investigated. Also, awareness of the feed mill owners on the utilization potentials of broiler beak by-product for macro elements was assessed.

THEORETICAL/CONCEPTUAL FRAMEWORK

This study built on the production input theory as put forward by Bass in 1969, who opined that production input provides sources of all elements needed by items under production and it is highly dependent on availability, quality and source of the materials. Within the context of broiler nutrition management, this theory will imply that improved feed production technologies entrenches delivery of a consistent and totally reliable source of mineral elements for all molecular and cellular needs of birds. Improved feed production technologies are often preferred for their standard quality, quantified potency, stability and full biological availability (Idio, 2009). Sustainable broiler production requires a focus on improving quality and quantity productivity through feeding well-balanced ration compounded with improved feed production technologies in addition to provision of other required inputs of safe and clean water for drinking, adequate shelter or pens, veterinary care, sanitation and other feeding and husbandry practices (Oyedipe, 2000).

EMPIRICAL REVIEW OF RELEVANT LITERATURE

According to Alu et al (2011), Calcium and Phosphorus represent the third most expensive nutrients after energy and protein. Calcium is required by broilers in greater amount that any other minerals. From numerous reports on the nutritional requirements for broilers, Calcium and Magnessium which are macro minerals are required for skeletal structures as bone teeth, beaks and muscle growth (Pond et al, 1995 and Eko, 2003). In terms of tissue abundance, Ca consists of about 99% of the animal body via skeletal tissues and occurs in about 2:1 ratio with P and Mg to give rigidity to bone. The remaining 1% is widely distributed through the organs and tissues with relatively large amount found in blood (Cromwell, 1982). According to Tion and Njoku (2009), blood cells are almost devoid of Calcium but the serum and plasma contain 9-12mg/dl in most species. The skeletal system is preferentially task to maintain serum calcium level vital to life of the animal and effects of calcium deficiency may first be shown as skeletal abnormalities. Other physiological functions of Calcium are in controlling the excitability of nerves, transmission of nerve impulses, muscle contraction as well as blood coagulation (Alu, 2011).As further reported by Tion and Njoku (2009), Oyster shell increased blood plasma Ca than the limestone, Smith and Kabaija(1985) and Tion et al (2005) asserted that limestone containing 38% Ca (95 % Calcium Carbonate) is more useful for livestock ration than limestone containing lower Ca content (32%, 34% and 36%). Limestone and Dicalcium phosphate have been used as sources for livestock all over the world but today they are extremely costly due to importation. Organic sources of calcium which are cheap and readily available include oyster shell and bone meal.

On the other hand, Mg is a constituent of skeletal tissues and it is required as activator to several enzyme systems (MacDonald et al, 2006). About 60-67% of Mg is in bones and teeth in the form of $MgCO_3$ and this varies with age Mg is important for the integrity of bones and teeth. Mg content in bones varies from 0.7% in young animals to 0.5% in older ones (McDowell, 1992). Mineral Analysis as reported by McDowell (1992) indicated that beak contain about 94% of Ca same as in the bone in the form of $CaCO_3$ and $Ca_3(PO_4)_2$ and this varies with age, sex, state of nutrition and species. Similarly, Mg makes up the remaining percentage of the beak component and occurs as $MgCO_3$.

MATERIALS AND METHODS

Study Location: The 2 month experiment was conducted at the Poultry Unit, Teaching and Research Farm of the University of Uyo, Akwa Ibom State, Nigeria. Geographical facts from

the University of Uyo indicate that lies between Latitude 5˚2' North and Longitude 7˚56' East with a natural day length of 12 – 13hrs. Uyo is also in the rainforest zone and has the monthly mean minimum temperature between 21.3˚C and 24.9˚C and mean maximum temperature between 28.4˚C and 34.5˚C. The annual mean rainfall is recorded between 2000mm and 3000mm while Relative Humidity ranges from 78 – 93%

Experimental birds and their management

Fifty (50) Amogbyn strain day-old broiler birds weighing 4g were reared under deep litter system to eight weeks. These birds were brooded for 4 weeks during which standard broiler starter mash and water were provided adlibitum. From the 5th to 8th week, the birds were transferred to permanent pens where standard broiler finisher mash and water were also provided adlibitum. These birds were weighed at the beginning of the experiment and thereafter at weekly intervals with sensitive balance scale (Ad Gulf, JS 600H) model. In both stages of management, appropriate medication and vaccination against diseases were administered routinely as scheduled.

Processing of specimen and Laboratory Analysis

Matured broilers with average weights between 2.75kg and 3.30kg were slaughtered by cervical dislocation and exsanguinated. Slaughtering took place in the Poultry Unit slaughtering slap under hygienic conditions using appropriate instruments to extract the beaks. The beaks weighing 4g and 5g on a standard sensitive scale (A & Gulf, JS 600H) were washed thoroughly with de-ionized water in the Animal Science Laboratory. By means of clean dry crucible dishes, the weighed fresh samples were set in an electric oven at initial temperature of 60˚C with subsequent adjustments to achieve constant moisture content level. The dried samples were then reweighed to a constant weights before digestion. The digestion was a wet basis type using Perchloric acid ($HClO_3$) and Nitric (HNO_3) acid in line with the procedures of AOAC (1995). In this paper, BUCK 200A model of Atomic Absorption Spectrophotometer (AAS) was adopted to assay, Ca and Mg minerals from the digesta. Calcium (Ca) Absorption mode was read at a wave length of 422.7NM while Mg Absorption mode was read at a wavelength of 362.4NM.

Data Analysis

Data collected from the laboratory analysis and as well as 30 own feed producers using snowballing technique. Data were subjected to descriptive statistics in order to understand the underlying dimension across the distribution pattern of the concentration of selected macro-minerals in the beak of the matured broiler. The descriptive statistics consisted of range, frequency counts, percentages and means. The in-depth interview with key informant survey was also used to gather data on beak awareness on utilization of matured broiler beak as composite feed resource.

RESULTS AND DISCUSSION

Table 1 below shows the distribution pattern of concentration of selected macro-minerals in matured beaks of broilers. Column A shows the concentration range of Ca and Mg. Ca had higher concentration than the Mg as indicated in Column D with mean values equivalent to the ratio 2:1. Columns B and C indicated that there is underlying distribution of the concentration of macro-mineral in the specimens. It also shows that not all broilers have the same level of

macro-mineral concentration. Column C further reveals that about 36% of the broilers used in the study were able to yield about 0.656 to 0.924g/kg Calcium and 0.4713 to 0.673g/kg of magnesium.In overall, the result presented in Table 1 is in line with the findings of McDowell (1992), Pond et al (1995) and Eko (2003) who reported that the concentration of minerals usually present in a given tissue vary considerably with species, sex, age, breed, health status, diet and chemical form of the elements. The high concentration of Ca over Mg in the beak has also supported the views of Mc Donald et al (2006) who reported that Ca in whatever form is about 94% of the constituent of skeletal tissues and usually occurs in the ratio of 2:1 with P and Mg.This result further agreed with the observation of Mc Dowell (1992) and Mc Donald et al (2006) that Mg occurring about 60 – 67% in bones and teeth counter balances the percentage composition of the skeletal tissue and usually decreases to about 0.5% in older animals.

Table 1: Concentration of Selected Macro-Mineral in Matured Beaks of Broilers.

Parameter (g/kg)	A Concentration Range	B Frequency (N=50)	C Percentage	D Mean	Standard Deviation
Ca	0.122-0.389	16	32.0	0.510	0.240
	0.389-0.656	16	32.0		
	0.656-0.924	18	36.0		
Mg	0.066-0.269	29	58.0	0.266	0.142
	0.269-0.471	18	36.0		
	0.471-0.673	03	6.0		

Source: lab analysis

Awareness level of Own feed Producers on Utilization of Matured Beak as Composite Feed Resource

Matured beak of broilers in the study area is usually considered as by-products by the general public, even among the poultry farmers including those that formulate their own meal. The dearth of information on this matter might not be unconnected to the available sources of information on poultry science to the poultry farmers, which receive information mostly from sales representatives or follow farmers and in long while from agricultural extension officers. The culture of periodic dissemination of discoveries via specialized magazines, catalogues and production journals in the developing countries are quite alien coupled with low literacy rate characterizing the socioeconomic status of poultry farmers make it difficult for useful information to diffuse at a faster rate. Based on the outcome of survey conducted on the own feed producers, their level of knowledge on the potential of matured broilers beak were generally bare. The results revealed that less than 14% of the own feed producers had a belief that matured broilers beaks can be a good source of macro nutrient elements as complementary feed resources. It was generally noted that most of the own feed producers (above 86%) were not aware of the mineral usefulness in specific elements contribution of the broiler beaks as alternative feed resource.

Table 2: Distribution of Respondents based Awareness on Utilization of Matured Beak as Composite Feed Resource

Item	Matured Beak of Broiler	No	Yes	No Idea
1	Is better in macro nutrient than micro nutrient	10.0(3)	13.3(4)	76.7(23)
2	Could be used as a better replacement for limestone	16.7(5)	13.3(4)	70.0(21)
3	It can offer more than 50% calcium concentration	0.0(0)	3.3(1)	96.7(29)
4	It can offer more than 20% Mg concentration	0.0(0)	3.3(1)	96.7(29)

Source: field survey

Matured Broiler Beak Feed Resource Imperative for Livestock Nutritional Extension

Based on the proximate analysis of matured broiler beak, the results indicated that the matured broiler beak is composed of both macro and micro minerals but the percentage composition of the macro minerals outweighs the micro-minerals. Further analysis of macro nutrients showed that calcium and magnesium are in abundance, these minerals are of serious physiological functions which thus become imperative livestock nutritional extension development and dissemination as alternative feed resource among own feed producers in the developing region. As earlier presented, the outcome of the survey and in-depth interview conducted on own feed producers to ascertain level of awareness of mineral compositions of matured broiler beak as composite feed resource revealed that the knowledge level on macro mineral composition among the own feed producers is virtually bare. This seemingly poor knowledge therefore becomes imperative for agents of agricultural extension systems in predominantly broiler production and consumption domains to exploit this by-product for economic gains to the farmers and overall wellbeing of the farmers. Currently in the study area, there is decline for the use of limestone as macro mineral sources due to its obvious health hazards. Besides, the technical capacity requirement among the own feed producers to process and obtain pure limestone for use in broiler feed formulation is prohibitive. Utilization and adoption of matured broiler beak as alternative source for composite nutrients resource in livestock nutrition would seriously be dependent on the existing networks of extension system and literacy index among livestock farmers. Thus, a simplified but procedural nutritional education for the low resource farmers would be inevitable.

Poor nutrition and management are the two most important constraints to livestock productivity. The basic reason for poor nutritional management of livestock in Nigeria is the inadequacy of feed both in quantity and quality; thus the resulting deficiencies have always been corrected by supplementation of the required nutrients (Idio, 2009). In addition, many feed resources that could have a major impact on livestock production continue to be either unused or poorly utilized. Babatunde (1991) established a strong positive correlation between adequate nutrition and livestock productivity: Animals which are adequately fed with the right feeds in essential minerals will not manifest the usual deficiency symptoms. In an earnest desire to address the feed challenges in broiler production, there is a need to confront and attend to the realities of broiler feed production dynamics. An efficient nutritional strategy should take into account the species, breed, age and the system of production. The importance of poultry feed in intensive production has been reported (Acholonu, 2000). Poultry industry is currently expanding and moving away from the outmoded and inefficient techniques in modern production systems (Idio, 2009). Improved production and management techniques have been responsible for its acceptance as a major quality protein supply platform.

In view of this relevance, the extension services whose major role is to disseminate useful information to improve poultry production should have strong liaison with livestock research

centres. This is because livestock research scientists must and should know what is occurring at the farm level in order to formulate valid and useful programmes for their research. They must also be aware of the social and economic environments in which their research findings will be used (Ekpere, 1990 and Idio, 2009). According to Williams and Williams (1991), livestock extension service has the responsibility to transfer improved practices in livestock husbandry and management to livestock farmers as well as form the link between livestock research centres and farmers. However, the livestock sector is beset by a complex of technical, social, economic, institutional and infrastructural constraints. Among the serious technical constraints are the inadequate nutrition, low genetic potentials and animal diseases, which of-course the rate of sustainable utilization innovation. The fundamental issues of technologies adoption effects are the outcome or derivable benefits or usefulness of the continuous adoption of the improved feed production technologies in feed production for poultry production. By increasing information through apt livestock extension service delivery on access to mineral nutrients, improved feed production technologies offers the potentials toward increase efficiency, productivity, competitiveness and growth in poultry business and livestock sector in general. There is hardly any field of livestock feed production wherein improved feed production technologies do not have a profound influence. If improved feed production technologies are not harnessed, birds face the threat of falling to deficiency attacks. The importance of adequate nutrition in a profitable broiler production enterprise has been reported by Obori (1991). When broilers are provided with quality feeds enriched and fortified with complete feed production technologies, it promotes growth, good health and performance. Improved feed production technologies are a productive resource.

CONCLUSION

Despite their seeming small concentrations in the beak, Calcium and Magnesium from beak can still be used at composite level to replace limestone in alternative feed sources for minerals. This study is a basic research in beak mineral concentration. Thus, following our extensive search for previous work, there seems to be paucity of information on the subject matter. Therefore, our study should be considered as pioneering work with intention of providing literature for all interesting scholars as well as providing materials for reference by other scholars. In addition, further investigations are needed to authenticate this research with other macro minerals and species of birds.

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