Use Of Millet in Partial Replacement of Poultry Feeds on Growth and Development of Broiler Chickens Reared at Fadil and Fareed Poultry Farms Gombe- Nigeria.

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Abstract- A study on the use of millet as a partial replacement of poultry feeds on the growth and development of broiler chickens was conducted at Fadil and Fareed poultry farms Gombe-Nigeria. A total of twenty chickens were used for this research, ten were fed with starter/finisher with 0% millet for six weeks and the other ten were fed with starter/finisher mixed with 60% millet for six weeks, and at the end of each week their weight is been taken to monitor their growth and development . The result of this research revealed that the growth and development of all the chickens reared with both feeds (starter/finisher with 0% millet and starter/finisher mixed with 60% millet) was adequate although starter/finisher with 0% millet was found to be more effective in terms of faster growth and development of the chickens for a limited period of time compared to the starter/finisher mixed with 60% millet. The study recommend the continues use of starter for two weeks and finisher for the remaining weeks as the best type of feeding that would boost the growth and development of poultry chickens, The study also recommend the use of finisher mixed with 20% millet after feeding them for two weeks with starter alone, as against the use of starter for two weeks and finisher mixed with 60% millet for the remaining weeks in order to reduce the cost of rearing poultry chickens with starter and finisher.

Index Terms- Broiler Feeds, Fadil and Fareed Poultry Farms, Growth and Development, Partial Replacement, Use of Millet

I. INTRODUCTION

POULTRY PRODUCTION

Poultry farming is the raising of domesticated birds such as chickens, turkey, ducks and geese, for the purpose of farming meat or eggs for food.

Poultry are farmed in great numbers with chicken being the most numerous. More than 50billion chickens are raised annually and as a source of food, for both their meat and their eggs. Chickens raised for eggs are usually called "layers" while chickens raised for meat are often called "broilers". *(Paul, et al, 2003).*

Poultry are kept in most areas of the world and provide an acceptable form of animal protein to most people throughout the world. During the last decade, many developing countries have adopted intensive poultry production in order to meet the demand for this form of animal protein. Intensively kept poultry is seen as a way of rapidly increasing animal protein supplies for rapidly increasing urban populations. Poultry are able to adapt to most areas of the world, are relatively low priced, reproduce rapidly and have a high rate of productivity. *(Kekeocha, 1985).*

Poultry in the industrial system are housed in confinement with the aim of creating optimal conditions of temperature and lighting, and in order to manipulate day – length to maximize production. *(Sunil, 1999).*

State of economy in developing countries has made the consumption of high quality animal protein food out of reach of more than 65 – 75% of the people *(Paul, et al, 2003).* Poultry production has been identified as one major means of solving these problems *(Paul, et al, 2003).* Poultry production is one of the most profitable businesses of agriculture that provides nutritious meat and eggs for human consumption within the shortest possible time; however, availability of quality feeds at affordable cost is a key to successful poultry operation *(Batal, et al, 2002).* Expenditure on the feeding of poultry constitutes over 65% of the total cost of poultry production *(Erikson et al, 2008).* This high cost of ingredients is responsible for the reduced profit margins which discourages large scale expansion in the poultry enterprise and consequently reduce supply of animal protein. This problem of animal protein is more pronounced in less developed nations *(FAO, 2010)* and this has always led to resurgence of interest in the sourcing of inexpensive alternative feed ingredients as replacement for the more expensive conventional ones in animal feed formulation. Due to high cost of conventional feed ingredients and scarcity of grains, the prices of commercial feeds have increased to over 30% of the feed mills while the few in production produce at below capacity level *(Erikson et al, 2008).*

As feed cost increases with the scale of production, animal production in Nigeria has not been able to satisfy the protein needs of the populace. *(Erikson et al, 2008).* High cost of feeds is a serious limitation to poultry in Nigeria which has been rated at 70 – 80% of the total cost of production *(Olanrewaju et al, 2007).* There are readily available high quality alternative agro-bye products of leguminous plants that are none or less cost and able to minimize the cost of production of meat *(Moyle et al, 2010).* This is because grain feed is limited and costly and has

militated against adequate animal protein production and intake in the country. To expand the poultry industry in Nigeria, efforts should be directed to the use of non-conventional feed ingredients. One amongst the ingredients is the millet been available in none or less cost *(Adejuro, 2004).*

POULTRY FEED FORMULATION

Feed formulation is the process of quantifying the amount of feed ingredients that need to be combined to form a single uniform mixture (diet) for poultry that supplies their entire nutrient requirement. Since feeds account for 65 – 75% of total live production cost for many type of poultry throughout the world, a simple mistake in diet formulation can be extremely expensive for a poultry producer *(Sunil, 1999).*

Feed formulation requires thorough understanding of the:

a. Nutrient requirement for the class of poultry (e.g., layers of egg, meat chickens or breeders);
b. Feed ingredients in terms of nutrients composition and constraints in terms of nutrition and processing, and
c. Cost and availability of ingredients.

Most large-scale poultry farmers have their own nutritionists and feed mills, whereas small operators depend usually on consultant nutritionists and commercial feed mills for their feeds. It is essential that formulations are accurate because once feeds are formulated and manufactured; it is often too late to remedy any mistakes or inaccuracies without incurring significant expenses *(Sunil, 1999).*

TYPICAL FORMULATION

Feed formulation is both a science and an art, requiring knowledge of feed and poultry, and some patience and innovation when using formulae. Typical formulations indicate the amounts of each ingredient that should be included in the diet, and then provide the concentration of nutrients composition in the diet. The nutrient composition of the diet will indicate the adequacy of the diet for the particular class of poultry for which it is prepared. It is common to show the energy value in Metabolizable energy (kcal or MJME/kg feed) and protein contents of the diet but comprehensive information on concentrations of mineral elements and digestible amino acids are also provided *(A.O.A.C, 1990).*

Digestible amino acids often include not just the first limiting amino acids, methionine, but also most of the ten essential amino acids. A number of data base are available to provide information on the digestible amino acid contents of various poultry feed ingredients *(A.O.A.C, 1990).*

LITERATURE REVIEW

BROILER

Broiler chickens (Gallus gallus domesticus) are a gallinaceous domesticated fowl, bred and raised specifically for meat production *(Garrigus, 2007).* They are a hybrid of the egg laying chicken, both being a sub-specie of the red jungle fowl (Gallus gallus). Typical broilers have white feathers and yellowish skin *(Erikson et.al. 2008).* Most commercial broilers reach slaughter weight at about five to seven weeks of age, although slower growing strains reach a slaughter weight at approximately 14weeks of age. Because the meat broilers are this young at slaughter, their behavior and physiology are that of an immature bird . Due to artificial selection of rapid early growth and the husbandry used to sustain this, broilers are susceptible to several welfare concerns, particularly skeletal malformation and dysfunction, skin and eye lesions and congestive heart conditions *(Tarranum. 2006).* The breeding stocks (broiler breeders) grow to maturity and beyond but also have welfare issues related to frustration of a high feeding motivation and beak firming. Broilers are usually grown as mixed sex flocks in large sheds under intensive conditions, but some strains can be grown as free range flocks. Chickens are one of the most common and widespread domestic animals, and with a population of almost 19billion in 2011, there are more chickens in the world than any other species of bird *(Kruchten, 2007).*

GENERAL BIOLOGY

Modern commercial broilers for example Cornish crosses and Cornish rocks *(Garrigus, 2007)*, are artificially selected and a breed for large-scale, efficient meat production and although they are the same species, grow much faster than egg layer of the traditional dual purpose breeds. They are noted for having very fast growth rates, a high feed convention ratio and low levels of activity *(Garrigus, 2007).*

Modern commercials boilers are bred to reach a slaughter-weight of about 2kg in only 35 to 49 days. Slow growing free range and organic strays have been developing which reach slaughter weight at 12 to 16 weeks of age. As a consequence, the behavior and physiology of boilers reared for meet are those of immature birds rather than adults *(Garrigus, 2007).*

Typical broilers have white feathers and yellowish skin. Recent genetics analysis have revealed that the gene for yellow skin was incorporated in to domestic birds through hybridization with gray jungle *(Sunil*, 1999). Modern crosses are also favorable for meat production because they lack the typical "hair which many breeds have that necessitates singeing after plucking. Both male and female boilers are resaved for their meat *(Sunil*, 1999).

BROILER PRODUCTION

A broiler is a type of chicken raised specifically for meat production. Broiler chicken production is one of the most progressive livestock enterprise in Africa today. Chicken broiler production is advantageous as it requires minimal land for housing only, as commercial feeds can be used for the enterprise. Because of their efficient meat conversion, broiler chickens are also popular in small family farms in rural communities where families raise small flocks of broiler for home consumption and local sale. Therefore the poultry industry began as a backyard enterprise which has grown to contract farming business. Alternative broiler markets which include hotels, institutional buyers, supermarkets, Butcheries etc. should be surveyed before starting a broiler business to ensure ready market at the time of harvest. The most profitable options between selling the birds dressed or live and selling in the market or at the farm gate should be chosen *(Garrigus, 2007).*

In Nigeria, the poultry industry plays a major role in contributing towards addressing key national development goals and improving the standard of living of people through poverty

alleviation and creating employment opportunities *(Davis et.al, 2003).*

Broiler production is raising or keeping of chickens (broilers) primarily for meat production. They key to successful broiler production depends on a systematic and efficient management and establishment programme the farmer has adopted. In addition, it is advisable to do proper planning and preparation well on time for the establishment of broiler production *(Kruchten, 2007).*

- **PLANNING AND PREPARATION FOR THE ARRIVAL OF DAY OLD CHICKS:**

Activities prior to the arrival day of the chicks include:

- Houses, surrounding areas and all equipment must be cleaned and disinfected before chick's arrival.
- Litter materials (wood shavings etc.) should be evenly spread throughout the brooding area to a depth of 8 – 10cm.
- Houses must be preheated for a minimum of 24 hours before the arrival of the chicks.
- Ensure that adequate clean water at room temperature is available. Water is vital in the early stages of the chick's development.
- Provide fresh, dust free starter crumbs in the brooder area. Ensure chicks have easy access to feeds (i.e. flat plans should be used, trays or paper sheeting's).
- Do not place feeders or drinkers directly under or near brooder.

THE BROILER PRODUCTION CYCLE

Day old chicks are bought locally and raised for 6 weeks after which the chicken houses are cleared, disinfected and allowed to rest for 2 weeks. At 5 weeks to 6 weeks, the broilers reach an average live weight at 2kg and are selected, slaughtered, packaged and sold to different market outlets. A complete cycle is therefore 8 weeks long, making it 6 to 7 complete cycles annually *(Dame row, 1995).*

HEALTH AND COMMON DISEASES

According to Turner et al., 2005, the common poultry diseases are Newcastle and infections bursal disease (Gumboro). The problems attributed to these diseases are water and feed consumption patterns, litter conditions, excessive mortality, chicken activity and behavior. Where Newcastle and Gumboro diseases are reported broiler chickens should be vaccinated with Lasota or Newcastle and H20 or mild strain vaccines mixed with drinking water once during the rearing period. Refer to chicken age based vaccination program (Table 1).

DISEASES AND CURLING

The general health of a flock influences feed conversions. Sick broilers do not perform well. Watch closely for early signs of disease and treat broilers quickly and properly. Carefully use vaccines and medications since reactions caused by improper administration can adversely affect weight gain and feed conversion. Eliminate, as early in the grow-out as possible, broilers that have no chance of making it to the market.

Obviously, an unhealthy broiler is likely to have poor feed efficiently. The main reason for this is that feed intake is reduced and so again proportionally more feed is directed towards maintenance. With enteric diseases there can be more subtle changes in feed utilization because various parasites and microbes can reduce the efficiency of digestion and absorption of nutrients.

A broiler with sub-clinical coccidiosis is not likely to absorb nutrients with optimum efficiency, because the oocytes will destroy some of the cell living the cut. More recently, the phenomenon of so called "feed passage" has been observed in broilers. Undigested feed particle are seen in the excreta, and so consequently feed efficiency will be affected. The exact cause of this problem is unknown but is more likely the consequence of a microbial challenge.

MILLET

Millets are a group of highly variable small-seeded grasses; widely grown around the world as cereal crops or grains for fodder and human food. They do not form a taxonomic group, but rather a functional or agronomic one. Millets are important crops in the semi-arid tropics of Asia and Africa (especially in India, Nigeria and Niger) with 97% of millet production in developing countries *(McDonough et.al, 2000).* The crop is favored due to its productivity and stunt growing season under dry high temperature condition.

The most widely grown millet is pearl millet, which is an important crop in India and parts of Africa *(annex II, 1992-94).* Finger millet, prose millet and foxtail millet are also important crop species. In the developed world, millets are less important. For example, in the United States only prose millet is significant and it is mostly grown for bird seed.

While millets are indigenous to many part of the world it is believed that they had and evolutionary origin in the tropical western Africa, as that is where the greatest numbers of both wild and cultivated forms exist *(Food And Agriculture Organization Of The United Nation , 2010).* Millets have been important food staples in human history particularly in Asia and Africa. They have been in cultivation in East Asia for the last 10,000 years *(Lauler, 2009).*

DESCRIPTION

The height pearl millet grain has great variation and can be nearly white, pearl yellow, brown, grey, slate blue or purple. The kernel shape has five different classification and operates on a three point system; obviate, hexagonal lanceolate, globular and elliptical *(McDonough, et.al, 2000).* Grains or pearl millets are about 3 to 4mm long, much larger than those of other millets. The seeds usually weight between 2.5 and 14mg with a typical mean of 8mg. The size of the pearl millet kernel is about one third that of sorghum. The relative proportion of germ and endosperm is higher in pearl millet than in sorghum.

The height of finger millet plant ranges from 40cm to 1metre, with the spike length ranging from 3 to13cm. The color of finger millet grains may vary from white through orange-red, deep brown, purple to almost black. The grains are smaller than those of pearl millet. The typical mean weight finger millet seed is about 2.6mg *(Food and Agriculture Organization of the United Nations, 2010)*

MILLET PRODUCTION

Peal millet is one of the two major crops in the semi-arid impoverished, less fertile agriculture regions of Africa and South Eastern Asia *(David D., 2002).* Millets are not only adapted to poor, droughty and infertile soils, but they are also more reliable under these conditions than most other grain crops. This has, in part, made millet production popular, particularly in countries surrounding the Sahara desert in western Africa.

Millets, however, do respond to high fertility and moisture on a per hectare basis, millet grain produced per hectare can be two to four times higher with use of irrigation and soil supplements. Improved breeds of millet improve their disease resistance and can significantly enhance farm yield productivity *(ICRISAT, the World Bank).*

India is the world's largest producer of millet. In the 1970s, all of the millet crops harvested in India were used as a food staple. By the 2000s, the annual millet production has increased in India; yet per capita consumption of millet had dropped between 50-75% in different regions of the country. As of 2005, most millets produced in India are used for alternative applications such as livestock fodder and alcohol production *(Basavaraj et.al, 2010).*

In 2010, the average yield of millet crops World Wide was 0.83 tons per hectare. The most productive millet farms in the word were France, with a nation Wide average yield of 3.3 tons per hectare in 2010 *(Food and Agriculture Organization of the United Nations, 2010).*

Table 1: BROILER VACCINATION PROGRAM

AGE	DISEASE	VACCINE
Day old	Newcastle	Lasota
Day 7	Infections bursal	IBD vaccine
Day 14	disease	Lasota
Day 21	Newcastle	Mild strain. (GV
	Gumboro	vaccine)

It is important that farmers request for a vaccination history when purchasing day old chicks from the suppliers because that will assist them to know what was done, not done and where to start *(Garrigus, 2007).*

II. MATERIALS AND METHODS

STUDY AREA

Fadil and Fareed Farms is located at Gombe Metropolis, the capital of Gombe State at the northeastern part of Nigeria, Gombe is on the coordinates $10^0$17'N $11^0$10'E. It has a total area of 52Km^2 (20sq mi) with a population of 280,000 people as per the 2006 census. Recent developments around the city are the attempts to generate electricity from the Dadin Kowa dam, establishment of Gombe State University in 2004 and the access via aviation at the Gombe International Airport. The airport has been operational since 2008 (Heart for Children Initiative Gombe Personal Procedure, 2014).

The study area has only two distinct seasons, the dry season (November – March) and rainy Season (April – October) with mean and annual rainfall of about 969mm, and the mean annual temperature ranges from about 50 – 100^{0}F (10 – 38^{0}C) (Heart for Children Initiative Gombe Personal Procedure, 2014).

EXPERIMENTAL ANIMALS AND MANAGEMENT

Twenty (Agric. Tech) breed of broiler chickens of one week has been used, by be subjecting them to two different dietary treatments (groups A & B) with 10chickens in each group. The birds have been fed with starter for two weeks in order to adapt to the feed before commencement of data collection which has lasted for a period of four more weeks. Diets A and B contain 0% and 60% of millet respectively, incorporated into the broiler starter and finisher feeds. Water have been given freely throughout the study period while feed of broiler starter – (chicks 0 – 6weeks = 8 25kg bags/100birds) has been given per each group.

The birds were reared in cages of wood and wired mesh in clean disinfected and well ventilated houses, vaccination (Lasota, Gumboro, Newcastle, Fowl fox) anti-stress and other routine management practices were strictly adhered to.

EXPERIMENTAL DIETS

Two experimental diets were used for the starter and finisher period, with millet as the test ingredient. The millet was used to replace 0% to 60% of the broiler starter and finisher portion of the experimental diets A & B respectively. Other ingredients that were used include; groundnut cake, fish and a small amount of salt.

ANIMAL MANAGEMENT

The birds were put in separate cages, the initial weight of individual birds were taken. Adjustment period of one week was allowed to enable birds to pass out previous feed eaten and get accustomed to the feed and the environment. After adjustment period, the experiment was continued. Strict aseptic conditions like the use of disinfectants to wash hand and foot at entrance were put in place too.

DATA COLLECTION

The quantities of feed supplied were weighed every morning and evening. The chickens were also weighed every week to record their growth (in Kg.).

TABLE 1 GROUP A: SHOWS GROWTH AND DEVELOPMENT OF BROILER CHICKENS FED WITH STARTER AND FINISHER WITH 0% MILLET (SIX WEEKS)

TIME OF MEASUREMENT	NUMBER OF CHICKENS	TYPE OF FEED	LEVEL OF GROWTH (KG)
1ST WEEK	10	STARTER	-
2ND WEEK	8	STARTER	0.5
3RD WEEK	6	STARTER	0.79

4TH WEEK	5	STARTER	0.99
5TH WEEK	5	FINISHER	1.50
6TH WEEK	5	FINISHER	1.98

Source: Field Work Adamu, 2015

TABLE 2 GROUP B: SHOWS GROWTH AND DEVELOPMENT OF BROILER CHICKENS FED WITH STARTER AND FINISHER MIXED WITH 60% MILLET FOR SIX (6) WEEKS

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TIME OF MEASUREMENT	NUMBER OF CHICKENS	TYPE OF FEED	LEVEL OF GROWTH (KG)
2ND WEEK	8	(60% MILLET) STARTER	0.5
3RD WEEK	5	(60% MILLET) STARTER	0.87
4TH WEEK	5	(60% MILLET) STARTER	0.99
5TH WEEK	4	FINISHER WITH 60% MILLET	1.10
6TH WEEK	4	FINISHER WITH 60% MILLET	1.45

Source: Field Work Adamu, 2015

PLATE 1: SHOWS BROILER CHICKS FOR THE RESEARCH AT BROODING STAGE.

PLATE 2: SHOWS BROILER CHICKENS FED WITH STARTER AND FINISHER WITH 0% MILLET (AT WEEK SIX (6) OF THE RESEARCH)

PLATE 3: SHOWS BROILER CHICKENS FED WITH STARTER AND FINISHER MIXED WITH 60% MILLET (AT WEEK SIX (6) OF THE RESEARCH)

DATA ANALYSIS

Regression Analysis for use of Millet as a Partial Replacement of poultry feeds

Correlations

		NumberofChicken	Starterandfinisher	MilletandStarter
Pearson Correlation	NumberofChicken	1.000	-.867	-.952
	Starterandfinisher	-.867	1.000	.965
	MilletandStarter	-.952	.965	1.000
Sig. (1-tailed)	NumberofChicken	.	.013	.002
	Starterandfinisher	.013	.	.001
	MilletandStarter	.002	.001	.
N	NumberofChicken	6	6	6
	Starterandfinisher	6	6	6
	MilletandStarter	6	6	6

Descriptive Statistics

	Mean	Std. Deviation	N
Number of Chicken	6.50	2.074	6
Starter/finisher	.9600	.70640	6
Millet/starter	.8183	.50626	6

From the above correlation table, greater percentage of the numbers are tending towards (1) and some are up to (1), it is an indication that a strong positive correlation do exist between the number of chickens, types of feeds and their growth and development of the poultry chickens reared at Fadil and Fareed poultry farm.

Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.971[a]	.943	.905	.640

a. Predictors: (Constant), Millet and Starter, Starter and finisher

b. Dependent Variable: Number of Chicken

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.271	2	10.136	24.748	.014[a]
	Residual	1.229	3	.410		
	Total	21.500	5			

a. Predictors: (Constant), MilletandStarter, Starter and finisher

b. Dependent Variable: Number of Chicken

From the above ANOVA table it is clear that our F: 24.748 calculated is greater than our F: 9.5521 tabulated, we will therefore reject the null-hypothesis and accept the alternative-hypothesis, and conclude that there is a significant relationship between the poultry type of feeds, growth and development of the poultry chickens reared at Fadil and Fareed poultry farms at 0.014 level of significance.

III. SUMMARY AND CONCLUSION

A study was carried out at Fadil and Fareed Poultry farms, Gombe-Nigeria with the aim of assessing the use of millet as a partial replacement of broiler feeds on the growth and development of broiler chickens reared there.The result of this investigation generally revealed that the growth and development of all the chickens reared with both feeds (starter/finisher with 0% millet and starter/finisher with 60% millet for six weeks respectively) was adequate, although starter/finisher with 0% millet was found to be more effective in terms of faster growth and development of the chickens for a very limited period of time compared to the starter/finisher with 60% millet

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IV. RECOMMENDATIONS

The research recommend the continues use of starter for two weeks and finisher for the remaining weeks as the best type of feeding that would boost the growth and development of poultry chickens. Also recommended is the use of finisher mixed with 20% millet after feeding them for two weeks with starter alone, as against the use of starter for two weeks and finisher mixed with 60% millet for the remaining weeks in order to reduce the cost of rearing poultry chickens with starter and finisher. It was also further recommended that Government should also try and provide poultry feeds to poultry farmers at a subsidized rate for the attainment of food security.

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