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COMPARATIVE ANALYSIS OF GROWTH PARAMETERS OF SOYBEAN AND SUNFLOWER FEED RATIONS IN BROILER PRODUCTION

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Abstract: *The purpose of this paper is to analyze the potentials of soybean and sunflower feed rations on the growth parameters of broilers. The study was carried out at the Department of Agricultural Extension and Management, Federal College of forestry, Jos, Plateau state. One hundred (100) day old broiler chicks were purchased and divided into two (2) groups (A and B) with three (3) replicates in each group. Group A were fed with soybean feed ration, while Group B was fed with sunflower feed ration over a period of eight (8) weeks. Descriptive, proximate analysis and statistical ratios were used in analyzing data for the study. Feed A is composed of soybean meal (55%), groundnut cake (40%) and yellow maize (15%), while feed B is composed of sunflower (55%) groundnut cake (40%) and yellow maize (15%). The result of the proximate analysis indicated that each feed ingredients contained crude protein, crude fiber, ash and fat in significant quantities. The survival rate for the duration of the feeding trials for treatment B was significant at 97%. The estimate of daily weight gain was significant for treatment B from week 1 to week 4 and week 5 to week 8 with an index of 0.205 and 0.537 respectively. Also, the feed conversion ratio for treatment B was significant. While the Protein efficiency ratio was significant for treatment A. The implication of these findings suggests that sunflower was a very palatable poultry feed ration, with significant effects on the growth parameters of broilers.***

Keywords: *Feed conversion ratio, feed intake, Survival rate, Weight gain.*

1. Introduction

The history of poultry feeding is one that has undergone drastic changes, particularly in Nigeria. In time past poultry birds were left to scavenge on the leftovers from the farms, kitchen and table and their production capacities were low. The output of these birds in terms of meat and egg production was low due largely to inadequate nutrition [1]. To improve productivity poultry birds require adequate feed and nutrients. The rapid development and application of technology in the area of poultry production have revolutionized and transformed it into a major occupation [2]. A good quality feed is one that is formulated to provide the appreciable levels of nutrients for the poultry birds to which it will be fed. It must be formulated bearing in mind the age and type of bird and also the purpose of production [3]. However, feeding of poultry commercially is complicated since unlike ruminants they require all the essential amino acids and vitamins of the B-complex group besides the other organic and inorganic nutrients. Feed being a primary expenditure in poultry production, represents 60%-65% of the absolute cost of production. Poultry feeds are frequently affected by price changes and supply deficits which further

constitute constraints in broiler production Soybean and Groundnut cake have traditionally been the main protein source in the formulation of poultry feed. This however has continued to increase in price and reduced in availability having a resultant increase in the cost of production. This can be attributed to poor harvest, competition between man and animal and increased cost of producing these crops therefore, necessitating the need to look into other ways or other protein sources that can be used to formulate feed, notably the use of sunflower meal. Therefore, this study was undertaken to assess potentials of sunflower meal as an alternative protein source for feed formulations in broiler production.

2. Matherials and methods

2.1. Study area

The study was carried out at the Department of Agricultural Extension and Management, Federal College of forestry, Jos North local government area of Plateau state, Nigeria. It is situated on latitude 9^{o}50 and 10^{o}05"N and longitude 8^{0}50" and 8^{0}55E, it covers a land area of about 3,365 square kilometers [4]. Jos has an altitude of about 1,200 meters above sea level and average annual rainfall ranges from 870mm to 1,55mm. Monthly average temperature ranges between 17^{o}C minimum and 38^{o}C maximum [4].

2.2. Analytical procedure and techniques

The sunflower used in ratio formulation was procured from Zaria, Kaduna State, while the other materials including the soybean cake, groundnut cake, maize, bone meal, salt, additives and cereal offal were obtained from markets in Jos metropolis. The actual feed formulation was carried out at the premises of the Federal College of Forestry, Jos. Descriptive, proximate analysis and statistical ratios were used in analyzing data for the study. The proximate composition of feeds includes crude protein (CP), crude fiber (CF), ash and amino acid (fat) contents in the rations. These components may be of interest for product development, quality control (QC) or regulatory purposes. Proximate Analysis stands for a method, which determines the values of the macronutrients in feed samples. In general, those values are being declared as nutritional facts shown usually on the labels of the final (end) food products, but they are also being determined during the production process. The primary objectives of proximate analyses are to measure the amount of each individual component in the feedstuff. The components measured are the nutrients. Depending on the specific analysis, the analysis will measure the total amount of the nutrient class or the amount of a specific nutrient within the nutrient class. For example, one analysis will measure the total amount of protein and another analysis will measure the individual amino acids in the feedstuff. The laboratory-based estimations provide an accurate measure of nutrient quantity. However, the laboratory-based estimations do not provide nutrient utilization information. The initial procedures used to estimate the quantity of an individual component of a feedstuff are the procedures of the proximate analysis system. Each of the procedures provides a quantitative assessment. The system is a series of chemical analyses to estimate the quantity of individual components of a feedstuff.

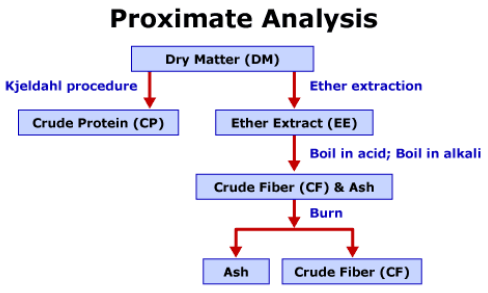

Fig.1. Proximate analysis system

Figure 1 is a brief diagram of the proximate analysis system.The initial procedure of proximate analysis is to determine the dry matter (DM) content of the feedstuff. The dry matter procedure removes the free water from the sample. To perform the procedure the original sample is weighed, the weighed sample is placed in a 105 degree Celsius oven for 12-16 hours, and the sample is reweighed. The dry matter and moisture content of the feedstuff are calculated. The second procedure of proximate analysis is to determine the crude protein (CP) content of the feedstuff. The crude protein procedure estimates the quantity of protein and non-protein nitrogen compounds in the feedstuff. The Kjeldahl method is used to measure the nitrogen content of the sample. The nitrogen content is converted to a crude protein estimate under the assumption all proteins contain approximately 16% nitrogen. The procedure consists of boiling a dried sample in sulfuric acid, the sample is then diluted with water and neutralized with sodium hydroxide, and finally, the sample is distilled and the distilled ammonium is titrated with a known concentrate of sulfuric acid. To determine crude protein content, the nitrogen value from the procedure is multiplied by 6.25. The procedure introduces two primary sources of error. The procedure incorrectly assumes all nitrogen-containing compounds are proteins and all nitrogen sources are 16% nitrogen. The crude fat or ether extract (EE) procedure estimates the quantity of lipids. To perform the procedure, the dried samples are ground and extracted with an organic solvent for 4 hours and the remaining residue is dried and weighed. Ether extract is the calculated as the difference between the original sample and the ether extract residue. The main source of error is the ether extract procedure incorrectly assumes all substances soluble in diethyl ether are lipids. The ash procedure estimates the quantity of inorganic material or minerals, known as ash, in the feedstuff. To perform the procedure, the sample is heated at 500-600 degrees Celsius for 2-4 hours and the remaining residue is weighed. The remaining residue is ash. The crude fiber (CF) procedure estimates hemicellulose, cellulose, lignin, pectin, and other components associated with the fibrous carbohydrates in feedstuffs. The process attempts to simulate the pH-related digestive processes in the stomach and the small intestine of the animal. The process does not account for enzymatic digestion. The sample is prepared by performing the dry matter and subsequently the ether extraction procedure on the sample. To perform the procedure the residue is boiled in a sulfuric acid solution for 30 minutes and rinsed, and then boiled in a sodium hydroxide solution for 30 minutes and rinsed. Finally, the residue is dried, weighed, ashed, and reweighed. The crude fiber content is estimated as the difference between the pre-ash weight and the post-ash weight. The crude fiber procedure has many sources of error and, therefore, is the most unsatisfactory principle of proximate analysis. The primary source of error is that the acidic and basic solutions solubilize some of the true fiber; therefore the procedure underestimates true fiber content of the feedstuff. Another source of error is proteins bound to insoluble fiber fractions are included in the crude fiber content, thus overestimating crude fiber. The inaccuracy of the procedure is the reason laboratories have replaced the crude fiber analysis with the detergent fiber system. The final component of proximate analysis is nitrogen-free extract (NFE). The nitrogen-free extract estimates non-fibrous carbohydrates, such as sugars and starches. The nitrogen free extract determination is the only estimate of

proximate analysis determined by a calculation of a difference versus chemical analysis followed by appropriate calculations. The calculation for nitrogen free extract is: % NFE = 100 % – (% EE + % CP + % Ash + % CF). As nitrogen-free extract is calculated by difference, all the errors associated with proximate analysis are additive in the estimate of nitrogen-free extract. The estimations of carbohydrates in the proximate analysis system, i.e. crude fiber and non-fiber extracts, especially for fibrous feedstuffs, have been replaced with the estimations provided by the detergent fiber system. One hundred (100) day old broiler chicks were obtained and grouped into two (2) treatments (A and B) with three (3) replicates in each treatment. Broiler chicks subjected to treatments A were fed with soybean meal over the period of the feed trials, while the ones subjected to treatment B was fed with sunflower meal over the period of the feed trials. The feed intake, mortality and growth parameters [5] were estimated. At the end of all the trials, the following growth parameters were determined;

a. Feed intake
b. Broiler survival (mortality rate)
c. Daily weight gain =
   Final weight – Initial weight/56 days..... (1)
d. Food conversion ratio (FCR) =
   Dry feed consumed/Broiler weight gain..... (2)
e. Protein Efficiency ratio (PER) =
   Broiler weight gain/Dietary protein consumed..... (3)

3. Results and discussion

3.1. Comparative analysis of feed ration composition

The results in Table 1 revealed the compositions of the feed rations. Feed A was composed of soybean meal (55%), groundnut cake (40%) and yellow maize (15%) and feed B was composed of sunflower (55%) groundnut cake (40%) and yellow maize (15%). Both feed rations indicated progressive increase in the growth parameters of broiler production over the period of 8 weeks. This result corroborates with the findings of [6] and [7], who also reported similar feed ration compositions.

Table 1

Comparative analysis of feed ration composition

	Feed A	%	Feed B	%
1.	Soybean	55	Sunflower	55
2.	Groundnut	40	Groundnut	40
3.	Yellow maize	15	Yellow maize	15

Source: Experimental data, 2018

3.2. Proximate analysis of feed ingredients

Table 2 shows the mean value of proximate analysis of feed ingredients; soybean cake, sunflower meal, groundnut cake and yellow maize.

The following results were obtained for soybean (44.9% crude protein, 5.5% crude fiber. 6.0% ash and 3.5% fat) sunflower (42% crude protein, 12% crude protein

5.8% ash and 7% fats) groundnut cake (43% crude protein, 3.8% crude fiber, 5.5% ash and 9.17% fats) and yellow maize (11.7% crude protein, 10.5% crude fiber, 0.8% ash and 1.7% fat), implying that the feed materials contained all the nutrient requirements for broiler production, this corroborates with the findings of [8]; [9]; [10]; [11] and [12] who also reported similar results on proximate analysis of poultry rations.

Table 2:
Mean values of proximate analysis of feed ingredients on dry weight basis (%)

Ingredients	Crude protein	Crude fiber	Ash	Fat
Soybean cake	44.90	5.50	6.00	3.50
Sun flower meal	42.00	12.00	5.80	7.00
Groundnut cake	43.00	3.81	5.50	9.17
Yellow maize	11.70	10.60	0.80	1.70

3.3. Comparative analysis of feed intake and growth parameters

The result in Table 3 reveals the quantity of feed intake and growth parameters of the broilers over a period of 8 weeks. Feed A: At week 1 - 4 the estimated amount of feed consumed was 25kg, survival rate was 95%, daily weight gain was 0.201kg, feed conversion ratio was 4.174 and protein efficiency ratio was estimates as 0.575. At week 5 - 8 the estimated amount of feed consumed was 50kg, survival rate was 95%, daily weight gain was 0.525kg, feed conversion ratio was 0.896 and protein efficiency ratio estimate was 0.861.

Feed B: At week 1 to 4 the estimated amount of feed consumed was 25kg, survival rate was 97%, daily weight gain was 0.205kg, feed conversion ratio was 4.331 and protein efficiency ratio was estimates as 0.563. At week 5 to 8 the estimated amount of feed consumed was 50kg, survival rate was 97%, daily weight gain was 0.537kg, feed conversion ratio was 0.915 and the estimate for protein efficiency ratio was 0.841. The survival rate of broilers for the duration of the feeding trial for treatment B was significant and estimated as 97%. The estimate of daily weight gain was significant for treatment B from weeks 1 - 4 and 5 - 8 with an index of 0.205 and 0.537 respectively.

Also, feed conversion ratio was significant for treatment B from weeks 1 - 4 and 5 – 8; the estimates were 4.331 and 0.915 respectively. However, the Protein efficiency ratio was significant for treatment A from weeks 1 - 4 and 5 – 8, with an index of 0.575 and 0.861 respectively. The implication of these findings suggests that sunflower feed ration was a more palatable poultry feed ration, with significant effects on the growth parameters of broilers. This result corroborates with the findings of [13]; [14]; [15]; and [16], who also reported similar effects on the growth parameters of broilers using similar feed ration compositions.

Table 3:
Comparative analysis of feed intake and growth parameters of broilers under feed trials

Growth Parameters	**Weeks 1 – 4**		**Weeks 5 – 8**	
	Feed A	Feed B	Feed A	Feed B
Feed intake (kg)	25	25	50	50
Survival rate (%)	95	97	95	97
Daily weight gain (kg)	0.201	0.205	0.525	0.537
Food conversion ratio	4.174	4.331	0.896	0.915
Protein efficiency ratio	0.575	0.563	0.861	0.841

Source: Experimental data, 2018

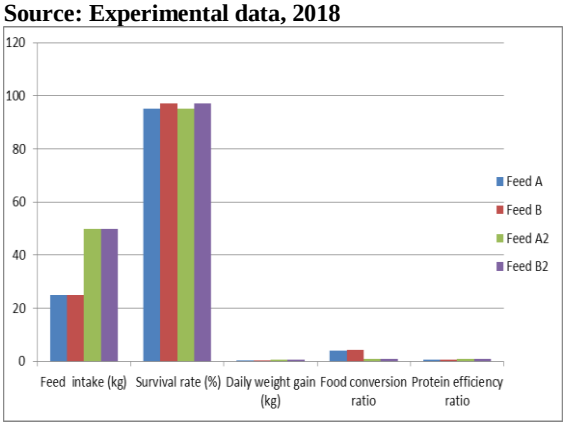

Fig. 2. Comparative analysis of feed intake and growth parameters of broilers under feed trials

4. Conclusion

This paper analyzed the potentials of soybean and sunflower feed rations on the growth parameters of broilers. Broiler chicks were purchased and divided into two (2) treatments (A and B). Treatment A was fed with soybean feed ration, while Treatment B was fed with sunflower feed ration over the period of the feed trials (8 weeks). The survival rate, daily weight gain and feed conversion ratio were significant for the broilers in treatment B. However, the Protein efficiency ratio was significant for the broilers in treatment A. The broilers in treatment B responded favorably to sunflower feed rations. The implication of these findings suggests that sunflower was a very palatable poultry feed ration, with significant effects on the growth parameters of broilers. Both feed rations indicated progressive increase in the growth parameters of the broilers over the period of the feed trials. The result also suggests that sunflower feed ration can be administered as a replacement or alternative for soybean feed ration in broiler ration formulation. From the results obtained, the following policy recommendations are suggested;
Multiplication of sunflower plants at commercial scale. Adoption and utilization of sunflower in poultry (Broiler) feed formulations. More research work on the nutrient component of sunflower seeds in feed rations should be carried out.

5. Acknowledgments

Author A and Author B designed the study, handled the computation of the statistical ratios and wrote the protocol and first draft of the manuscript. Author B and Author C managed the analyses of the study. Author D and Author E managed the literature searches. All authors read and approved the final manuscript.

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