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EFFECTS OF SORGHUMS BASED FEED ON BROILER CHICKENS WEIGHT GAIN FOR AGRIBUSINESS IN BAUCHI STATE, NIGERIA

[1]ADAMU I., ISHAQB.A. AND [1]CHIROMA D.

[1]Department of Vocational and Technology Education, Faculty of Technology Education, Abubakar Tafawa Balewa University, Bauchi

Corresponding Author: adamugadabs@gmail.com

ABSTRACT

The study investigated the effects of sorghums feed on broiler chickens weight gain and carcass quality for agribusiness in Bauchi state, Nigeria. Experimental research design was adopted for the study using one hundred broilers chickens. The chickens were grouped into four and feed with different source of energy feed (Maize, White Sorghum, Red Sorghum and Yellow Sorghum) but with similar treatments. At the end of the experiment, four broilers were randomly selected from each starved for 12 hours from each group, weighed and slaughtered for carcass evaluation. The weighed of edible parts was recorded for carcass quality. The data collected were analyzed using mean score for research questions while ANOVA was employed to test the null hypotheses at the 0.05 level of significance. The study revealed that the no significant difference among the average weight gains, carcass quality, average total cost and profits of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum. It was concluded that replacing the use of sorghum-based as source of energy of broilers chickens with improve the profitability of the business. The study recommended that Sorghum feeds should be used as a replacement of maize for broiler chicken agri-business in Bauchi state

Keywords: Sorghums, Feed, Broiler, Chickens, Weight, Carcass, Agribusiness

INTRODUCTION

Broiler chicken production industry is an important source of animal protein in Bauchi state. Evidence by Sunil (2015) revealed an increased demand of poultry meat of 70,000 kg per month in the northern regions of Bauchi for broiler meat by consumers. The major advantage of broiler chicken meat is its lower iron contents lead to increase in its demand (Atteh, 2012). With the increase in demand of meat and strive for self-reliance, many people venture into farming of broilers. The success of broiler farming as business venture is dependent upon supplying the birds with feed of the highest achievable quality, in terms of ingredients used, processing procedures applied as well as the form in which the diet is presented to broilers. Arbor (2009) observed that maize is the chief energy source in compounded diets and constitutes about 50% of poultry ration. Atteh (2012) reported that maize being the major energy source in broiler chicken's production, provide live weight to the birds (weight gain) which enable them to use the sensitive balance on daily basis during both starter and finisher phases, and also it improves the carcass quality after bleeding and de-feathered.

Maize as the major energy source in broilers chicken's production also provides food and fuel for human being and feed for animals, it has great nutritional value and can be used as raw material for manufacturing many

industrial products (Afzal, Nasir, Bashir, andKhan2009). Furlan, (2016) reported that the metabolizable energy and crude protein of maize has led to high demand that eventually led to increase in its price which affects the profitability of the poultry farm. The author stressed the situation has discourage poultry farming among many farmers. To address the problem, scholars in agriculture have been carrying studies on the solution of the problem. To this end, the study conducted by Leite (2012) reported that grains such as sorghum are nutritionally similar to corn and might be alternatives as feed. In terms of the nutritive value, cost and availability, sorghum grain is the next alternative to maize in poultry feed (Subramanian and Metta, 2010).

The study of Aduku (2015) shows that varieties of sorghum, climatic and soil conditions, fertilizer types are listed among the factors responsible for the variations in chemical composition of sorghum. Based on these citations, the research investigated the: (1) differences between the average weight gains of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness; (2) difference between the average carcass quality of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness; (3) differences between the average total cost incurred of breeding broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness; and (4) differences between the average profits of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness in Bauchi State.

MATERIALS AND METHODS

Experimental Design

The design used for this study was experimental design where 100-day old broilers were assigned to one control and three different experimental groups following a completely randomized design (CRD). Completely randomized designs are for studying the effects of one primary factor without the need to take other nuisance variables into account. Each treatment group had four replicates of 25 healthy day-old birds per treatment. The broilers were randomly distributed by counting 5 to avoid bias in the distribution. This replicates the group to give near uniform initial weights for all the groups. The experimental design is as presented in Table 1.

Table 1: Experimental designs guide

Group	Pretreatment	Feeding	Post treatment
Experimental	Pretreatment test	Red Sorghum	Post treatment test
Experimental	Pretreatment test	White Sorghum	Post treatment test
Experimental	Pretreatment test	Yellow	Post treatment test
Control group	Pretreatment test	Maize	Post treatment test

One hundred (100) broiler chickens were used for the study. The chickens were group in to four (4) constituting twenty-five (25) in each group: The chickens were randomly assigned to one control and two experimental groups.In the control diet, maize was served as the main energy source without sorghum grain inclusion. The three designed diets contain the same percentage of sorghum grains in replacement for maize, respectively.

Ingredients and Experimental Ratios

The feed ingredients that was used in the formulation of the control and the different experimental ratios of the study were 40% Maize grain or Sorghum grains, while wheat offal, soybean meal, bone meal, fish meal, vitamin premix, and salt were mixed and grind together at required levels of inclusion for formulation of the starter feeds. The combination of finishers' feeds was the same, however, the maize grain and Sorghum grains constitute 50% at the level, Chemical analysis was adopted from representative samples of the individual ingredients. Based on the adopted ingredient analysis results; four treatment rations were formulated. The proportion and composition of feed ingredients for starter and the finisher phases for the study are shown in Table 3 and 4. Each week, five broiler chickens were weighed to obtain the average weight gain using sensitive balance.

Table 3: Composition of the Broiler chicken feed for starter phase

S/N	Experimental grains	Wheat of fal	Fish meal	Bone meal	Lime stone	Salt	Soya Bean	lysine	Methionine	Vitamin Premix	Total % of igdts
1	Maize 40%	15%	10%	5%	7%	0.5 %	20%	0.5%	1.5%	O.5%	100%
2	Red Sorghum 40%	15%	10%	5%	7%	0.5 %	20%	0.5%	1.5%	0.5%	100%
3	Yellow Sorghum 40%	15%	10%	5%	7%	0.5 %	20%	0.5%	1.5%	0.5%	100%
4	White sorghum 40%	15%	10%	5%	7%	0.5 %	20%	0.5%	1.5%	0.5%	100%

Source**:** Emmanuel (2014)

Table 4: Composition of the Broiler chicken feed for the finisher phase

S/N	Experimental grains	Wheat offal	Fish meal	Bone meal	Lime stone	Salt	Soya Bean	lysine	Methionine	Vitamin Premix	Total % of igdts
1	Maize 50%	15%	5%	10%	7%	0.5%	15%	0.5%	1.5%	O.5%	100%
2	Red Sorghum 50%	15%	5%	10%	7%	0.5%	15%	0.5%	1.5%	0.5%	100%
3	Yellow Sorghum 50%	15%	5%	10%	7%	0.5%	15%	0.5%	1.5%	0.5%	100%
4	Maize 50%	15%	5%	10%	7%	0.5%	15%	0.5%	1.5%	0.5%	100%

Source: Emmanuel (2014)

Management of Experimental Birds

One hundred Hubbard classic broiler chickens were raised in a floor system fences which was partitioned into 4 fences, each with stocking density of 25 chickens per m^2 from day old to seven weeks of age. The fences and the equipment were properly clean and disinfected and infra-red lamps, drinkers and feeders were placed in each fence before the arrival of the chicks. After the arrival of the chicks, initial weight was obtained using sensitive balance. Feed was given to chickens for three weeks and then after two feeders and drinkers was added. Body weight changes are taken using sensitive balance every week starting from day old. The chicks were vaccinated with live vaccine against marek's disease at the first day and against Newcastle Disease (HB1) on third and 21st day through ocular

and against Gumburo at 21 days through drinking water. Two mortality was observed from the maize and yellow sorghum groups.

Data Collection

The first data collected was weights gain of each chicken using sensitive balance scale. The second data was weekly feed and maintenance cost for the various groups of chickens, at the end of the experimental period the cost was sum up. The average weight of the carcass was recorded from four sample birds following completely randomized design, to determine the carcass quality. The experimental exercise ended at the 7th week while the carcass evaluation was conducted in the 8th week.

Carcass Traits

At the end of the experiment, four broilers were randomly selected from each replication (16 birds from all the groups) and starved for 12 hours, weighed and slaughtered for carcass evaluation. After slaughtering, the researcher de-feathered the birds, eviscerated and carcass cuts, edible parts, weighed and recorded for carcass quality. Eviscerated carcass weight was determined after removing blood, feather, shank, head, heart, liver, gizzard, kidney, lung, pancreas, crop, pro-ventricles, small and large intestine, caecum and urogenital tracts.

Data Analysis

Data collected were analyzed in two stages. In first stage, mean, and mean difference was used to answer the four research questions. In the second stage, Analysis of Variance (ANOVA) was employed to test the null hypotheses at the 0.05 level of significance. ANOVA was used in testing the hypothesis because

RESULTS

The results of average weight gains of the four groups of broilers chicken is as presented in Table 5. The result indicated that the average weight of broiler chickens fed with maize was 1728 gram, that of red sorghum was 1708 gram. Chickens fed with yellow sorghum had average weight of 1723 gram and those feed with white sorghum had 1798 gram. The average mean weight gains of ±5 to ±90 grams obtained indicated that there were very slight differences.

Table 5: Mean comparison the weight gains of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness

Feeding	Average weight gain	Comparison	Mean Difference (I-J)	Decision
Maize	1728	2.00	-70	VSD
		3.00	05	VSD
		4.00	20	VSD
White sorghum	1798	1.00	-70	VSD
		3.00	75	VSD
		4.00	90	VSD
Yellow sorghum	1723	1.00	-5	VSD
		2.00	-75	VSD
		4.00	15	VSD
Red sorghum	1708	1.00	-20	VSD
		2.00	-90	VSD
		3.00	-15	VSD

The mean analysis on difference between the carcass qualities of broiler chickens is presented in Table 6. From the Table, the weight of carcass qualities of broiler chickens fed with fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness stood at 1621, 1566, 1560 and 1632.The difference range between ±72 grams indicated that there was very slight difference among the broilers.

Table 6: Mean comparison the carcass quality of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness

Feeding	Average Carcass quality	Comparison	Mean Difference (I-J)	Decision
		2.00	55.00	Slight difference
Maize	1621	3.00	-11.00	Slight difference
		4.00	61.00	Slight difference
		1.00	-55.00	Slight difference
Red sorghum	1566	3.00	-66.00	Slight difference
		4.00	6.00	Slight difference
		1.00	-8.00	Slight difference
White sorghum	1632	2.00	47.00	Slight difference
		4.00	72.00	Slight difference
		1.00	-61.00	Slight difference
		2.00	-6.00	Slight difference
Yellow sorghum	1560		-72.00	
		3.00		Slight difference

The result of mean cost incurred for breeding each of four groups of broiler chickens is as presented in Table 7. The result revealed the average total cost of each broiler chickens fed with maize was N1, 116. Broiler chickens fed with red sorghum had average total cost of N1068. The average total cost of broiler chickens fed with white sorghum was 1055 and the average total cost of chickens fed with yellow sorghum was N1062. The average total cost of broiler chickens fed with maize was the highest (1116). The mean differences obtained ranged ±N0, 061which fall under the very slight differences (VSD).

Table 7: Mean comparison of the total cost incurred of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness

Feeding	Average cost	Comparison	Mean Difference (I-J)	Decision
		2.00	48	VSD
Maize	1116	3.00	61	VSD
		4.00	54	VSD
		1.00	-48`	VSD
Red sorghum	1068	3.00	13	VSD
		4.00	06	VSD
		1.00	-61	VSD
White sorghum	1055	2.00	-13	VSD
		4.00	-07	VSD
		1.00	-54	VSD
Yellow sorghum	1062	2.00	-06	VSD
		3.00	-7	VSD

The result presented in Table 8 revealed the average profit of N334 for broilers chicken fed with Maize. The average profit of broiler chickens fed with red sorghum was N382. The average profits of broilers chickens fed with white sorghum and that fed with yellow sorghum stood at N395 and N388 respectively. The profitability difference of ±N0,061 falls under the benchmark of very slight difference.

Table 8: Mean comparison the profits of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness

S/N	Feeding	Average Disposable price	Total cost	Profit	Comparison	Diff	Remark
					2	-48	VSD
1	Maize		1116	334	3	-61	VSD
					4	-54	VSD
					1	48	VSD
2	Red sorghum		1068	382	3	-13	VSD
					4	-6	VSD
		1450			1	61	VSD
3	White sorghum		1055	395	2	13	VSD
					4	7	VSD
					1	54	VSD
4	Yellow sorghum		1062	388	2	6	VSD
					3	-7	VSD

The result of test of null hypothesis one in Table 9 revealed the F-value of .001 with p-value of .692. The p-value obtained was greater than the level of significance (.692>0.05), the result therefore suggested that there was no significant difference among the weight gains of the four groups of the broiler chickens. The hypothesis was therefore retained.

Table 9: Analysis of Variance used to test null Hypothesis one

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	4683.781	3	1561.260	.001	f.692
Within Groups	30775361.418	96	320576.661		
Total	30780045.199	99			

The test of difference among the four groups of broiler chickens presented in Table 10 revealed the F (.003) while p=.077. The p-value obtained no significant differences among the carcass quality of broiler chickens fed with maize, white sorghum was greater than the alpha value (.077>0.05), the result therefore suggested that there were no significant differences among the average carcass quality of the four groups of the broiler chickens. The hypothesis was retained.

Table 10: Analysis of Variance used to test null Hypothesis Two

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	17642.578	3	5880.859	0.003	.077
Within Groups	35789729.622	16	2236858.101		
Total	35807372.200	19			

The result of ANOVA in Table 11 used to test null hypothesis three revealed the F-value of .003 and the P-value of .721. The p-value obtained was found to be greater than

the level of significance (.721>0.05). The result therefore indicated that there was no significant difference among the total cost incurred among the four groups of broiler chickens. The hypothesis has been retained.

Table 11: Analysis of Variance used to test null Hypothesis Three

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	211034.393	3	70344.798	.003	.721
Within Groups	482869699.714	96	5061142.705		
Total	483080734.107	99			

The Table 12 shows the output of the ANOVA analysis used to test the whether there is a statistically significant difference among the profits of the groups of the broiler chickens involved in the study. The result revealed the F-value of .084 and the p-value of .968. The p-value of .968 was found to be greater than the 0.05 level of significance. The result therefore suggested that there was no statistically significant difference among the profits of the four groups of broiler chickens. The hypothesis was retained.

Table 12: Analysis of Variance used to test null Hypothesis Four

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5552615.125	3	1850871.708	.084	.968
Within Groups	442525360.833	16	276657835.052		
Total	448077975.958	19			

DISCUSSION

The study disclosed that no significant difference among the average weight gains of broiler chicken fed with Maize and those fed variety of sorghums. The outcome agreed with that of Etuk et al. (2012) whose study reported that though the crude protein content of sorghum is higher than that of maize but the difference in the weight gains of the chicken fed with sorghum and those fed with maize was not significant. Similarly, study conducted by Adamu *et al* (2015), Gebeyew *et al.,* (2015); Silveira *et al* (2016) and Mabelebele *et al. (*2017) whose study indicated that the weight gain of birds fed maize and finger sorghum diets were insignificant. The finding of study also revealed that no significant difference among the average Carcass quality of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum. This finding is in agreement with the report of Ibrahim *et al.,* (2010), Idahor (2013), and Yunusa *et al.* (2014) who discovered that most of the carcass and gut parameters did not differ significantly except for live weight, kidney weight, plucked weight, eviscerated weight, carcass weight, kidney weight, gizzard weight. Anca (2017) study reported that using either sorghum or millet in place of maize have no adverse effect on the carcass and gut characteristics of broiler chickens.

Furthermore, the study shows that no significant difference among the mean cost incurred for breeding each of four groups of broiler chickens. This finding is in agreement with the reports of Sanaa *et al*., (2014), Gebeyew *et al*., (2015) and Aduku (2015) who reported that sorghum can replace yellow corn without adverse effect on performance, carcass criteria and economic cost in broiler diets. The authors argued that, no significant difference found among cost of feeding and maintenance of broiler chickens fed with Maize, sorghum

and millets. On the profitability of the broiler's chickens, the study shows that no significant difference among the average profits of broiler chickens fed with maize, red sorghum, yellow sorghum and white sorghum for students' agribusiness in Bauchi state. The result affirmed the earlier study conducted by Idahor et al., (2013), Sanaa and Abdel-Wareth (2014), Yunusa *et. al.* (2014) who reported that no significant difference was found in the profitability of broiler chickens fed with variety of cereal crops. Similarly, the study of Anca (2017) reported that using sorghum, millet or maize have no adverse effect on the profitability of broiler chickens.

CONCLUSION

Based on the outcome of the study, it was observed that sorghum can replace maize in feeding broiler chicken without adverse effect on performance, carcass criteria, and economic cost. It was concluded that feeding broilers chickens with sorghum-based feeds with increase the profitability of the business. Based on the foregoing, the study recommended that sorghum should be used as replacement of maize in feeding broiler chicken for agribusiness in Bauchi state.

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