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Nutrients Digestibility and Cost Analysis of Broiler Chickens Fed Diets Containing Graded Levels of Brewer's Dried Grains with Enzyme and Yeast

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Abstract: Eight weeks feeding trial was carried out using a total of one hundred and forty seven day old broiler chicks to assess nutrients digestibility and cost analysis of broiler chickens fed diets containing graded levels of brewer's dried grains supplemented enzyme and yeast. Seven experimental diets (T1, T2, T3, T4, T5, T6 and T7) were formulated using brewers dried grains at three different dietary inclusion levels of 5%, 10%, and 15%. Diet 1 was the basal diet (control) designated as T1, Diets 2, 3 and 4 consisted of 5, 10 and 15% BDG as replacement for maize supplemented with 200mg/100kg enzyme designated as T2, T3 and T4 while diets 5, 6, 7 consisted 5, 10 and 15% BDG as replacement for maize supplemented with 200mg/100kg yeast designated as T5, T6 and T7 respectively. The diets were formulated for starter phase (1-4 weeks) and finisher phase (5-8 weeks) respectively. Results of nutrients digestibility revealed the percentage dry matter, crude protein, crude fibre, ether extract, ash and nitrogen free extract were significantly ($P < 0.05$) affected across all the dietary treatments. Cost benefit analysis revealed the cost of feed consumed, cost of production, total revenue and cost benefit were significantly ($P < 0.05$) affected across the dietary treatments. Cost benefit was significantly higher ($P < 0.05$) in values of ₦ 87.04 and ₦ 981.47 (T4 and T7) with 15% BDG supplemented with enzyme and yeast at both starter and finisher phases respectively. From the results obtained in this study, 15% BDG supplemented with phytase enzyme and yeast can be included to replace maize in broiler diets for higher profit margin without negatively affecting performance.

Keywords: Brewers Dried Grains, Enzyme, Yeast, Nutrients Digestibility, Cost Analysis, Broiler Chickens

1. Introduction

Poultry remains relatively affordable source of animal protein with high biological value for human consumption and also plays a vital role in poverty alleviation, free from religious taboo and economic constraints which affects the commercial production of livestock. They are characterized

by low capital requirement and quick returns [15, 16]. It has been observed that poultry products (meat and egg) offer considerable potential for bridging the gap of animal protein needed in the diets of a human being [16].

Cereal grains especially maize has been for long used as conventional energy source in broiler production. This is simply because maize served as the basis on which other grains are compared [2]. The ever escalating cost of maize, increased competition for its usage and its inadequate production to meet the needs of man and his livestock made it critical to look inward and consider the use of non-conventional feedstuffs [5]. The by-products of our local varieties of cereal like sorghum and millet which are relatively cheap and locally available can favourably compete with maize in broiler diets [11].

Brewers dried grains (BDG) a by-product of the beer industry might offer a suitable cheap substitute for maize. It can be incorporated in breeder ration without adverse effect on performance. It is used as a source of energy and contains other essential nutrients which are required in feed formulation for poultry. BDG was reported to contain over 20% crude protein, about 6% ether extract, over 15% crude fibre and about 4% ash [4] and [9]. BDG needs to be dried before incorporation in poultry rations and when not properly dried, it will cause fermentation which will reduce nutritive value of the products.

BDG has high fibre content, poor nutritive value and unsuitability for direct animal use [7]. Hence, the need for BDG be supplemented with additives (Yeast and Enzyme). Yeast and Enzyme has been long used to increase broiler's growth rate, and control diseases [4]. They are performance enhancer through improvement in nutrients of poultry feeds. Yeast is considered as one of the living micro-organism that when administered through digestive tract had positive impact on broiler health through nutritional effect [18]. It also boosts immune level resulting in a better protection against infection [17]. Yeast and Enzyme also improves nutrients digestibility and feed efficiencies in corn- based diets [20].

Agro-by-products are noted for high fibre content which is a major problem for their efficient use in monogastric animal nutrition. Monogastric animals such as pigs and poultry have low capability of handling cellulose, hemicelluloses and lignin which form the major components of agro-industrial products. However, efforts are being made to hydrolyze these structural carbohydrates and protein so as to make their active ingredients available in monogastric animal nutrition. The escalating prices, scarcity as well as the high level of competition between man and livestock on conventional feedstuff (maize) is progressively reducing the expected profit margin of livestock farmers in Nigeria and other developing countries across the globe. Hence, the search for alternative feed sources has become inevitable to reduce the feed cost.

This study was therefore aimed at assessing nutrients digestibility and cost analysis of broiler chickens fed diets containing graded levels of brewers dried grains with enzyme and yeast.

2. Materials and Methods

2.1. Experimental Site

The research was carried out at the Poultry Unit of the Teaching and Research Farm, Taraba State University, Jalingo; It lies between latitude 8°50 N and longitudes 11°31 E Situated in the Northern.

Guinea Savannah zone with an annual rainfall range of 1000 mm to 1500 mm, the ambient temperature of the area range between 38°C - 41°C. The rain season being at its peak in June and September. The dry season is between November and March with the harmatan wind blowing from the north east Sahara and Sahel region [21].

2.2. Test Ingredients and Preparation

Brewer's Dried Grains (BDG) was collected fresh from producer of local drink (burukutu) at Jalingo. It was spread in a polythene sheets and sun-dried for 3 days to avoid fermentation which could reduce the nutritive value of the products. It was packed inside polythene bag and kept in cool dried place till the period of compounding the experimental diets.

2.3. Experimental Diets

Seven experimental diets (T1, T2, T3, T4, T5, T6 and T7) were formulated using brewers dried grain at three different dietary inclusion levels of 5%, 10% and 15% based on the standard requirements for broilers [14]. Diet 1 was the basal diet (control) designated as T1, Diets 2, 3 and 4 consisted of 5, 10 and 15% BDG in replacement of maize supplemented with 200mg/100kg phase enzyme designated as T2, T3 and T4 while diets 5, 6, 7 consisted 5, 10 and 15% BDG in replacement of maize supplemented with 200mg/100kg yeast designated as T5, T6 and T7 respectively. The diets were formulated for starter phase (1-4 weeks) and finisher phase (5-8 weeks) as presented in Tables 1 and 2 below.

2.4. Experimental Birds, Design and Management

A total of one hundred and forty seven (147) day-old broiler chicks were purchased from a commercial hatchery at Jos, Plateau State. The birds were weighed at the commencement of the experiment, and were randomly divided into seven treatment groups of 21 birds each. Each treatment group was replicated three times with 7 birds per replicate in a Completely Randomized Design. The birds were raised for 8 weeks in two phases; starter phase (1-4 weeks) and finisher phase (5-8 weeks). Feed and clean water were provided *ad libitum* while routine vaccination, medication and management practices were strictly followed.

Table 1. *Composition of a Starter Broiler Chickens Diets Containing Graded Levels of Brewers Dried Grains Supplemented with Phytase Enzyme and Yeast (1-4 weeks).*

Ingredients	T1 Control	Enzyme (200mg)			Yeast (200mg)		
		T2	T3	T4	T5	T6	T7
		5%	10%	15%	5%	10%	15%
Maize	50.00	47.50	45.00	42.50	47.50	45.00	42.50
BDG	0.00	2.50	5.00	7.50	2.50	5.00	7.50
Soya beans (FFS)	21.00	21.00	21.00	21.00	21.00	21.00	21.00
G N C	16.60	16.60	16.60	16.60	16.60	16.60	16.60
Fish meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Rice offal	5.05	5.05	5.05	5.05	5.05	5.05	5.05
Bone meal	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt/NaCl	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamins premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated Analysis							
Metabolizable energy (kcal/kg)	2923.65	2901.23	2878.80	2856.38	2901.23	2878.80	2856.38
Crude protein (%)	22.67	23.12	23.57	23.90	23.12	23.57	23.90
E E (%)	4.30	4.31	4.33	4.35	4.31	4.33	4.35
Crude fiber (%)	3.64	3.88	4.12	4.36	3.88	4.12	4.36
Calcium (%)	1.12	1.13	1.13	1.14	1.13	1.13	1.14
Phosphorus (%)	0.66	0.66	0.67	0,67	0.66	0.67	0,67
Lysine (%)	1.17	1.19	1.20	1,22	1.19	1.20	1,22
Methionine (%)	0.61	0.62	0.63	0.64	0.62	0.63	0.64

*Biomix premix provided per kg of diet: Vit A. 1334i.u, Vit D_3 2,680 i.u, Vit E 10 i.u; Vit K 2.68mg; Calcium Pantothenete, 10.68mg; Vit B1 0.022MG; Folic aci 0.668mg; Choline chloride, 400mg, Chlortetracycline, 26.68mg; Manganese 133.34mg; Iron, 66.68mg; Zinc, 55.34mg, Copper, 3.2mg; Iodine, 1.86; Cobalt, 0.268mg, Selenium 0.108mg. GNC = Ground Nut Cake, BDG = Brewer Dried Grain, EE = Ether Extract.

Table 2. *Composition of a Finisher Broiler Chickens Diets Containing Graded Levels of Brewers Dried Grain Supplemented with Phytase Enzyme and Yeast (5-8 weeks).*

Ingredients	T1 Control	Enzyme (200mg)			Yeast (200mg)		
		T2	T3	T4	T5	T6	T7
		5%	10%	15%	5%	10%	15%
Maize	61.00	57.95	54.90	51.85	57.95	54.90	51.85
BDG	0.00	3.05	6.10	9.15	3.05	6.10	9.15
Soya beans (FFS)	16.10	16.10	16.10	16.10	16.10	16.10	16.10
GNC	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Fish meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Rice offal	5.05	5.05	5.05	5.05	5.05	5.05	5.05
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00	.00
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt/NaCl	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamins premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis							
Metabolizable energy (kcal/kg)	3,002.29	2,974.89	2,947.53	2,920.17	2,974.89	2,947.53	2,920.17
Crude protein (%)	19.20	19.74	20.29	20.84	19.74	20.29	20.84
Ether Extract (%)	6.50	6.60	6.71	6.81	6.60	6.71	6.81
Crude fiber (%)	3.35	3.64	3.94	4.23	3.64	3.94	4.23
Calcium (%)	0.93	0.94	0.95	0.96	0.94	0.95	0.96
Phosphorus (%)	0.56	0.57	0.58	0.59	0.57	0.58	0.59
Lysine (%)	0.96	0.98	1.00	1.02	0.98	1.00	1.02
Methionine (%)	0.56	0.57	0.58	0.60	0.57	0.58	0.60

*Biomix premix provided per kg of diet: Vit A. 13. 34i.u, Vit D_3 2,680 i.u, Vit E 10 i.u; Vit K 2.68mg; Calcium Pantothenete, 10. 68mg; Vit B1 0.022MG; Folic aci 0.668mg; Choline chloride, 400mg, Chlortetracycline, 26.68mg; Manganese 133.34mg; Iron, 66.68mg; Zinc, 55.34mg, Copper, 3.2mg; Iodine, 1.86; Cobalt 0.268mg. Selenium 0.108mg. GNC = Ground Nut Cake, BDG = Brewer Dried Grain.

2.5. Data Collection

Nutrients Digestibility

Metabolic trial was conducted at the 8th week of the study. The birds were weighed and a total of 21 birds were used for this study. Three birds were selected from each treatment with one bird per pen and each had the average weight of the birds housed in metabolic cages for faecal collection which lasted for 3 days. The birds were allowed to acclimatize for two days adjustment period before faecal collection. 200 grammes of the experimental diets were supplied to the birds in each cage daily for three days. The total faecal output for each pen was bucked together. Samples of the diets and faecal droppings from birds were taken to the biochemical laboratory, Department of Animal Science Moddibo Adama University of Technology, Yola for proximate analysis according to the method described by (1).

Formulae for Calculation

Dry matter digestibility

$$DM = \frac{Feed\ intake\ g \times \%\ DM(f) - Excreta\ Output\ g\ (DM) \times DM(Ex)}{Feed\ intake\ g \times \%\ DM(f)} \times \frac{100}{1}$$

Protein retention

$$CP = \frac{Feed\ intake\ g \times \%\ DM(f) \times \%\ CP(f) - Excreta\ Output\ g\ (DM) \times DM(Ex) \times \%\ CP\ (Ex)}{Feed\ intake\ g \times \%\ DM(f) \times \%\ CP\ (f)} \times \frac{100}{1}$$

Crude Fibre digestibility

$$CF = \frac{Feed\ intake\ g \times \%\ DM(f) \times \%\ CF(f) - Excreta\ Output\ g\ (DM) \times DM(Ex) \times \%\ CF\ (Ex)}{Feed\ intake\ g \times \%\ DM(f) \times \%\ CF\ (f)} \times \frac{100}{1}$$

Ether extract digestibility

$$EE = \frac{Feed\ intake\ g \times \%\ DM(f) \times \%\ EE(f) - Excreta\ Output\ g\ (DM) \times DM(Ex) \times \%\ EE\ (Ex)}{Feed\ intake\ g \times \%\ DM(f) \times \%\ EE(f)} \times \frac{100}{1}$$

Ash digestibility

$$Ash = \frac{Feed\ intake\ g \times \%\ DM(f) \times \%\ Ash\ (f) - Excreta\ Output\ g\ (DM) \times DM(Ex) \times \%\ Ash\ (Ex)}{Feed\ intake\ g \times \%\ DM(f) \times \%\ Ash\ (f)} \times \frac{100}{1}$$

Nitrogen Free Extract

$$NFE = \frac{Feed\ intake\ g \times \%\ DM(f) \times \%\ NFE(f) - Excreta\ Output\ g\ (DM) \times DM(Ex) \times \%\ NFE\ (Ex)}{Feed\ intake\ g \times \%\ DM(f) \times \%\ NFE(f)} \times \frac{100}{1}$$

Cost-Benefit Analysis of Feed.

At the end of the 8th week of feeding trial, the following parameters were determined using the procedure of (13).

$$Cost\ of\ feed\ per\ kg\ (₦) = \frac{quantity\ of\ ingredients \times cost\ per\ kg\ ingredient}{100}$$

Cost of feed consumed per bird (₦) = Cost Per kg of feed × total feed intake per bird (kg)

Cost/kg gain = Cost of feed per kg x FCR

Operational Cost = cost of vaccine + cost of drugs + cost of transport + cost of water + cost of disinfectant

$$Feed\ cost\ (\%) = \frac{Cost\ of\ feed\ consumed}{Cost\ of\ production} \text{ x } \frac{100}{1}$$

Cost of production = operational cost +Cost of feed consumed

Total cost = cost of production + cost of Chicks

Revenue generated per bird =Final weight (kg) × cost price/kg live weight

Profit =Revenue – total cost

2.6. Statistical Analysis

All data collected in this study were subjected to analysis of variance using the SPSS software [19]. Significant differences among treatment means were separated using Duncan's New Multiple Range Test (DNMRT) [19].

3. Results and Discussion

Results of nutrients digestibility of broiler finisher chickens fed diets containing graded levels of brewer's dried

grains (BDG) supplemented with phytase enzyme and yeast is presented in Table 3. Digestibility of dry matter (%), ash (%), crude protein (%), nitrogen free extract (%), ether extract (%) and CP (%) showed a significant (P<0.05) effect among the dietary treatments.

Dry matter content was significantly (P<0.05) higher in T3 (83.82%) and was comparable to those in other treatments except treatment 4 which had the least value (75.18%). This study disagrees with the findings of [8] who observed that the digestibility of dry matter and protein did not differ among broiler finisher birds fed maize sorghum based BDG diets at 15-30% levels of inclusion. The significantly (P<0.05) higher crude protein values (82.43%) obtained in T3 (10% BDG supplemented with enzyme) and (82.50%) obtained in T7 (15% BDG supplemented with yeast) were similar to those of other dietary treatments except T4 (66.14%) containing 15% BDG supplemented with enzyme which had the least value. The fibre digestibility were statistically (P<0.05) higher in T3 (68.60%) but comparable to those in other treatments except T7 with the least statistical value (15.3%) where BDG was included up to 15% in the diet. This result showed that the birds were unable to utilise and digest fibre effectively due to higher fibre content of the diets. [12] had earlier reported that digestibility depends on the proportion of cellulose, hemicelluloses and lignin which formed the major part of agro by-products.

Table 3. *Effects of Diets Containing Graded Levels of BDG Supplemented with Enzyme and Yeast on the Nutrients Digestibility of Broiler Finisher Chickens.*

Parameters	T1 (control)	Enzyme (200 mg)			Yeast (200 mg)			SEM
		T2	T3	T4	T5	T6	T7	
		(5%)	(10%)	(15%)	(5%)	(10%)	(15%)	
DM (%)	80.82^{ab}	77.53^{abc}	83.82^{a}	75.18^{b}	78.45^{abc}	81.19^{ab}	78.20^{abc}	1.22
Crude Protein (%)	77.79^{ab}	74.86^{ab}	82.43^{a}	66.14^{b}	74.72^{ab}	79.30^{ab}	82.50^{a}	2.09
Fibre (%)	60.8^{ab}	28.2^{bc}	68.6^{a}	43.5^{abc}	25.3^{bc}	35.2^{abc}	15.3^{c}	5.71
Ether extract (%)	77.84^{abc}	71.66^{bc}	83.93^{abcs}	78.08^{abc}	68.28^{c}	87.16^{ab}	90.85^{a}	2.04
Ash (%)	66.15^{b}	73.37^{ab}	78.84^{ab}	67.47^{ab}	67.55^{ab}	84.36^{a}	85.31^{a}	2.39
NFE (%)	87.32^{ab}	86.77^{ab}	87.19^{ab}	87.44^{ab}	88.08^{a}	85.59^{ab}	81.90^{b}	1.34

$^{a, b, c}$ Means in the same row with different superscripts are significantly different (P<0.05), SEM= Standard Error of Mean.

Table 4. *Cost Benefit Analysis of Broiler Chickens Fed Diets Containing Graded Levels of BDG Supplement with Enzyme and Yeast (1 – 8 weeks).*

Parameters	T1 Control	Enzyme (200mg)			Yeast (200mg)			SEM
		T2	T3	T4	T5	T6	T7	
		5%	10%	15%	5%	10%	15%	
Starter (1-4 weeks)								
Cost of diet (₦)	113.37	111.21	109.10	107.22	110.11	108.12	106.13	0.512
Cost of Feed Consumed (₦)	147.35^{ab}	157.81^{a}	143.29^{ab}	147.64^{ab}	156.07^{ab}	147.59^{ab}	141.92^{b}	2.724
Cost/kg gain (₦)	268.68^{ab}	279.87^{ab}	273.47^{ab}	263.04^{b}	311.61^{a}	283.63^{ab}	273.10^{ab}	5.646
Operational cost (₦)	55.00	55.00	55.00	55.00	55.00	55.00	55.00	0.000
Cost of Production (₦)	201.37^{ab}	212.81^{a}	198.29^{ab}	202.64^{ab}	211.07^{ab}	202.59^{ab}	196.92^{b}	2.724
Feed cost (₦)	72.52	74.14	72.08	72.85	73.87	72.81	71.97	0.374
Cost of chicks (₦)	290.00	290.00	290.00	290.00	290.00	290.00	290.00	0.000
Total cost (₦)	491.35	502.81	488.29	492.64	501.07	492.59	146.92	2.724
Total revenue (₦)	562.67^{ab}	553.65^{ab}	544.12^{ab}	579.68^{a}	526.35^{b}	542.85^{ab}	540.95^{ab}	7.701
Cost Benefit (₦)	71.31^{ab}	50.84^{ab}	55.82^{ab}	87.04^{a}	25.27^{b}	50.26^{ab}	54.02^{ab}	7.329
Finisher (5-8 weeks)								
Cost of diet (₦)	103.00	106.14	104.28	104.42	103.94	102.08	100.22	0.39
Cost of FC (₦)	375.38^{ab}	395.99^{a}	391.63^{ab}	367.74^{b}	389.83^{ab}	380.70^{ab}	388.70^{ab}	4.902
Cost kg gain (₦)	450.80^{b}	532.82^{ab}	556.86^{ab}	488.54^{ab}	461.49^{ab}	522.99^{ab}	582.95^{a}	16.944
Operational Cost (₦)	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Cost of Production (₦)	425.38^{ab}	451.99^{a}	441.63^{ab}	417.74^{b}	439.83^{ab}	430.70^{ab}	442.03^{ab}	5.38
Feed Cost (₦)	88.23	88.75	88.63	88.02	87.93	88.39	88.69	0.13
Cost of Chicks (₦)	602.03	602.04	602.03	602.04	602.04	602.04	602.04	0.005
Total Cost (₦)	102.74	104.80	104.37	101.98	104.19	103.27	104.41	4.932
Total revenue (₦)	1271.11^{ab}	1212.22^{ab}	1168.89^{ab}	1212.7^{ab}	1291.11^{a}	1188.89^{ab}	1142.22^{b}	17.121
Cost Benefit (₦)	243.71^{ab}	158.22^{bc}	125.23^{c}	192.93^{b}	249.24^{ab}	156.16^{bc}	981.47^{a}	19.21

^{ab}Mean in the same row with different superscripts are significantly different (P<0.05), SEM= Standard Error of Mean.

The significantly (P<0.05) higher fat digestibility (90.85%) obtained in T7 containing 15% BDG supplemented with yeast is in contrast with the findings of [12] who stated that the binding of fat by minerals reduces crude fat digestibility, especially calcium reaction with fatty acids. The significantly (P<0.05) higher ash digestibility values (84.36% and (85.31%) obtained in birds fed diets T6 and T7 were at par with values obtained in other treatments supplemented with enzyme and yeast except those fed the control diet. This indicated that yeast and enzyme supplemented diets had higher mineral nutrient profile than those in the control group. Nitrogen free extract was significantly (P<0.05) higher in diet T5 (88.08%) containing 5% BDG supplemented with yeast but comparable with other treatments except T7 which

had the least value (81.90%). This agrees with findings of [8] who reported that digestibility did not differ among broiler finisher fed maize sorghurn based diets with BDG at 15-30% inclusion levels. [10] also indicated that fibre influences the excretion of nitrogen by repartitioning nitrogen from urine to faeces.

Cost Cost Benefit Analysis of Broiler Chickens Fed Diets Containing Graded Levels of Brewers Dried Grain Phytase with Enzyme and Yeast Supplementation.

Cost benefit analysis of broiler chickens fed diets containing graded levels of brewers dried grain phytase with enzyme and yeast supplementation is presented in Table 4.

Cost of feed consumed (₦), cost of production (₦), total revenue (₦), and cost benefit (₦) were significantly affected across the dietary treatments. The higher ($P<0.05$) cost benefit (₦ 87.04, ₦ 981.47) that was observed in chickens fed diet containing 15% BDG supplemented with enzyme and yeast 200 mg/100 kg at both starter and finisher phases was better compared to those other dietary treatments. Higher value of ₦ 579.68 observed in T4 containing 15% BDG with enzyme supplementation for total revenue was at par with other dietary treatments except T5 with the least value of ₦ 526.35. This higher cost benefit observed in diets T4 and T7 may be attributed to reduction in cost per kg of BDG at 15% inclusion level in the diets. This agrees with the findings of [8] who reported that incorporation of Maize Sorghum Brewers Dried Grains at 15-20% level as a replacement for maize in broiler chickens diet reduced the cost per kg weight gain and reduced the cost of broiler production up to 50%. The least values (₦ 141.92, ₦ 367.74) obtained in birds fed 15% BDG with yeast and enzyme supplementation (T7 and T4) for cost of feed consumed and cost /kg gain at both starter and finisher phases was better as the main target of farmer is to have efficient production at least cost to boost their chances of profitability. No significant ($P>0.05$) effect of treatments observed among other parameters such as operational cost, feed cost and total cost. This could be attributed to moderate value recorded for cost of feed per kg.

4. Conclusion and Recommendations

4.1. Conclusion

1) Inclusion of BDG with phytase enzyme supplementation (200mg/100kg) at 15% had a significant effect on nutrient digestibility of broiler chickens.
2) BDG with yeast (200mg/100kg) supplementation at 5% had a significant effect on nutrients digestibility of broiler chickens.
3) BDG supplemented with yeast (200mg/100kg) at 15% in broiler chickens diets improved economic production of the birds.
4) Inclusion of BDG supplemented with phytase enzyme (200mg/100kg) at 15% had a higher numerical value for profit margin.
5) Farmers should adopt the use of BDG supplemented with yeast (200mg/100kg) at 15% inclusion levels in poultry diets for higher profit margin and less cost of production.

4.2. Recommendations

1) BDG with enzyme (200mg/100kg) supplementation at 15% had no negative effect on nutrients digestibility and had higher profit margin.
2) BDG supplemented with yeast (200mg/100kg) at 15% in broiler diets increased higher profit margin.
3) Farmers should adopt the use of BDG supplemented with phytase enzyme and yeast (200mg/100kg) at 15% inclusion levels in poultry diets for higher profit margin, less cost and without negatively affecting production.

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