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Utilization of Graded Levels of "*Gayamba*" Millet *Pennisetum species* Variety by Broiler Chickens

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Target Audience: Poultry farmers, Animal Nutritionist, Animal Scientist

Abstract

An experiment was conducted to evaluate the performance, carcass characteristics and economics of broiler chickens fed diets containing graded levels of "Gayamba" millet. Five diets were formulated for both starter and finisher phases in which "Gayamba" millet replaced yellow maize at 0, 25, 50, 75 and 100% levels and the diets were designated as treatments T_1, T_2, T_3, T_4, and T_5 respectively. Two hundred and twenty (220) Marshall Breed broiler chicks were randomly allotted to five dietary treatments replicated four times with eleven birds per replicate in completely randomized design. At the starter phase, which lasted for four weeks, daily feed intake (59. 09 - 59.89g) was not significantly affected by the dietary treatments. Birds on T_1 had a significantly ($P<0.05$) lower daily weight (20.97g) than birds on T_5 (23.85g). Daily weight gain was also significantly ($P<0.05$) influenced with birds on T_5 having a value of 23.80g while T_1 had a value of 20.97g. At the finisher phase, there was no significant difference across the dietary treatments. Most of the carcass parameters were not affected by dietary treatments. However, a significant ($P<0.05$) difference was recorded on kidney and heart for the dietary treatments. Feed cost in ₦/kg gain was lower (₦209.33) in T_5 but higher (₦ 237.88) in T_4. It was therefore, concluded that "Gayamba" millet variety could be used as an alternative to maize in broiler diets without detrimental effect on the performance and carcass yield of broiler chickens.

Description of Problem

The level of Animal protein intake in most developing countries of the world is low due to high cost of feed ingredients with its resultant high cost of production (1). Poultry production represents the fastest means of correcting the shortage of Animal protein intake. This is because apart from the high rate of production, poultry has the best efficiency of nutrient transformation into high quality Animal protein. Energy feeds stuffs constitute between 60% to 75% of finished feed for monogastric animals (2), and currently maize is the most widely used cereal grain in poultry feeding around the world and is regarded as possessing better nutritional value than other cereal grains. But its use by poultry industry is limited because of the competition for it by man, the beverage industries and livestock production (3). This competition arose as a result of low production level of maize in Nigeria leading high cost of livestock fed which in turn reduces the expected profit of farmers (4). Due to inadequate supply and high cost of maize as a major source of energy, cheaper alternative ingredients with the same or better nutritive values are now being explored as energy sources in poultry ration. In

order to arrest the escalating feed cost and other constraints such as inadequate rainfall distribution, poor soils and insufficient supply of fertilizer, there is need to evaluate the advantage of including "Gayamba" millet variety as an alternative energy source in the diet of broiler chickens. The objective of the study therefore, is to determine the performance of broilers fed diets containing "Gayamba" millet variety.

Materials and Methods

Experimental site

The study was conducted at the Federal College of Education Agricultural Farm Pankshin, Pankshin Local Government Area of Plateau State. Pankshin is located at latitude 9. 9^0N and Longitude 9.92^0E respectively; with a minimum temperature of 10^0C and maximum of 27^0C (Dafur *et al.*, 2008) .

Experimental Birds and their management

A total of 250 Marshall Breed day old chicks were procured from distributors of Bachelor farms in Jos. The chicks were brooded for one week in a deep litter house. During the brooding period a commercial broiler starter mash (Amo feeds) was used to feed the birds. Two hundred and twenty (220) birds were randomly allotted to five treatments of forty-four (44) birds each made up of four replications with eleven (11) birds per replicate. Each replicate was housed in a pen covered with wood shaving as litter material equipped with feeders and drinkers. The birds were vaccinated according to vaccination schedules of the study area. The diets along with clean drinking water were provided *ad libitum* throughout the fifty-six (56) days of the experiment. All necessary daily and occasional routine management practices were adhered to.

Experimental diets

Five experimental diets for both the starter (23%CP) and finisher (20%CP) phases in which "Gayamba" millet variety replaced yellow maize at 0, 25, 50, 75 and 100% levels coded T_1, T_2, T_3, T_4, T_5 respectively were formulated. Other ingredients contained in the diets are groundnut cake, fish meal, wheat offal, bone meal, limestone, premix, salt, methionine and lysine (Table 1 and 2).

Experimental Design and Data Collection

The experimental design used was completely randomized design (CRD). The chickens were offered experimental diets and water *ad libitum* and any leftover feed was recorded each day. They were weighed individually at the start of the experiment and subsequently on weekly bases. Weight gain and feed intake were determined, Feed Conversion Ratio (FCR) and cost per kg live weight gain were also calculated. The chickens were fasted for 12 hours, weight and slaughtered to determine the carcass, and organ characteristics. Two birds from each replication were randomly selected and sacrificed for carcass analysis. Carcass parameters, such as dressing percentage, carcass weight, head, leg, abdominal fat and weight of visceral organs (heart, kidney, lungs, caeca, spleen, small intestine, large intestine, gizzard and liver) were recorded. The number of mortality was also recorded.

Data Analysis

The data collected were subjected to analysis of variance (ANOVA) as described by steel and Torrie (1980) and differences among treatment means were separated using Dunncan"s Multiple Range Test (Duncan, 1955).

Result and Disscusion

Performance Attributes:

The daily feed intake at the starter phase showed no significant difference ($P>0.05$) among treatments (Table 3). This observation conforms to the findings of (5) in millet meal as possible alternative dietary energy sources

for broilers chickens. However, the daily weight gain was significantly (P<0.05) different among dietary treatment for the starter phase. This is in conformity with the (6) who showed that the used of millet in poultry in the tropics result in higher performance with no detrimental effects. Feed conversion ratio showed a significant (P<0.05) different among dietary treatments at the starter phase. Birds on treatments 5 (100% millet) tend to have a better (2.50) ratio compared to other treatments. This observation agreed with (7) in the use of different energy sources on the performance of broiler chickens. The daily feed intake at the finisher phase showed no significant difference (P>0.05) among dietary treatments (Table 4). This observation is in agreement with the findings of (8) who fed graded levels of whole millet in broiler diets and reported no significant difference in weight gain of broilers fed whole millet. The feed conversion ratio showed no significant difference among dietary treatments at the finisher phase. This agrees with the findings of (9) who evaluated the response of broiler starter fed whole millet. The overall result of the experiment did not show any significant influence (P>0.05) on all the parameters studied (Table 5). The feed intake (87.58 vs 88.79g) is similar to the report of (10). The daily weight gain (32.60 vs 36.72g) and feed conversion ratio (2.38 vs 2.63) conforms with the findings of (10) who reported that millet in broiler diets gave a higher average body weights than maize and the use of millet in broiler diet was more rewarding than maize in terms of feed conversion respectively. At the end of the experiment (eight weeks) total of thirteen birds died. The mortality rate was highest (4) in birds on diet 4 (75% millet). This fall within the 5% mortality level in good management practices (11).

Carcass yield, Organ and Gut Characteristics

It was observed that almost all the carcass parameters studied at the end of the experiment did not show any significant difference (P>0.05) among the dietary treatments (Table 6). Parameters like live, eviscerated and carcass weights tend to decrease numerically with increasing levels of "Gayamba" millet. The dressing percentage ranged between 73.99 (0% millet) to 68.43% (75% millet). The observation agrees with the work of (12) Abate and Gomez, (1983) who reported a decrease in growth rate of chicks with increasing level of Bulrush millet.

Organ and Gut characteristics

The result of organ and gut weight (gizzard, liver, pancreas intestines, abdominal fat, spleen, kidney) expressed as percentage of the Body weight showed no significant difference (P<0.05) among dietary treatments. However, significant difference (P<0.05) was recorded for the kidney in favor of birds fed 100% "Gayamba" millet diet. Similarly a significant (P<0.05) was recorded for the heart. This is in agreement with the findings of (13) who observed a significant influence in all carcass parameters of birds where pearl millet replaced maize in the diet of broilers.

Cost-benefit Analysis

The highest feed intake was recorded in birds fed diets 1 and 4 while the lowest was recorded in birds fed diet 3. Birds fed diet 5 (100% "Gayamba" millet) had the lowest feed cost (₦/kg fed). A high total weight gain was recorded in birds fed diets 5 while the lowest was recorded in birds fed diets 1. The highest total feed cost was recorded in treatment 1 (control) while the lowest in treatment of 5 (100% "Gayamba" millet). Feed cost/kg live weight was lower (₦ 209.33) in treatment 5 (100% millet) while the highest value (₦ 237.88) was in treatment 4 (75% "Gayamba"

millet). A saving of ₦12. 12 was recorded in diet 5. This show that the level of utilization of "Gayamba" millet diet recorded an increase in total weight gain while the cost of feed per kg gain decrease with increasing level of "Gayamba" millet. This is in conformation with the report of (14) who fed graded levels of millet to broilers.

Conclusion and Applications

1. The results indicate that "Gayamba" millet variety could be included at 100% level to replace maize in the diets of broilers without any negative effect on their growth performance, carcass yield and also reduce cost of feed per kg live weight gain.
2. Therefore, "Gayamba" millet variety can be used as an alternative energy source in the diets of broilers.

References

1. Esonu, B.O, Agbabiaka, L..A and Osegbue, A.I. (2014). Efficacy of enzyme supplementation of dried rumen digesta for broiler finisher production. *Tropical Journal of Agriculture*, 91 (4): 248-255.
2. Eyenihi, G.E., Esiegwu, A.C., Esonu, B.O, Uchegbu, M.C and Udedibie, A.B.I (2013). Gelatinization of fermented cassava tuber meal and its nutritive value for broilers. *Nigeria Journal Animal Production***,** 40(2):71-79
3. Iji P.A (2010). Alternative feed ingredient to meet the present environment challenges: lessons from other parts of the world. *Nigeria Poultry Science Journal*, 6:51- 56.
4. Durunna, C.S. Udedibie, A.B.I. and Anyanwu, G.A. (2000). Combination of maize/sorghum-based dried brewers grains, cocoyam corn and cassava tuber meals as substitute for maize in the diets of laying hens. *Proc. Of the 25th annual Conference. of the Nigerian Society for Animal Production.* Pp 169-173 at Umudike: Theme: "Animal production in the New Millennium: challenges and options".
5. Ojewola, G.S and Olugbemi. F. (2011). Millet meal: A Possible Alternative dietary energy sources for broilers chickens. *Proceedings 26th conference of Nigerian society for Animal Production* 13- l6th March, Abuja Nigeria.
6. Flurharty, F.L and Leaoch, S.C (1996). Effects of dietary energy sources and level of performance of newly arrived feed for calves. *Journal of Animal Science*, 74:504 - 513.
7. Adamu, S.B Waziri, Y.B. and Abbotor, F.I. (2001). The use of different energy sources on the performance of broiler chickens under a semi — arid environment. *Proceedings of 6th Annual conference of Animal Science Association of Nigeria* 17 — 19th September, 2001, Maiduguri, Nigeria.
8. Hildago, M.A. Davis, A.J. Dale, N.M, Dozier, W.A. (2004). Use of whole pearl millet in broiler diet. *Journal of Applied Poultry Research,* 13 (2), 229-234.
9. Abubakar, A, Bello, A, Tukur,H. M and Bashar, Y.A (2011). Whole Millet in the diets of Broiler starter in a semi-Arid Environment of Nigeria. *Proceedings of the 36th Conference of Nigerian Society for Animal Production* 13 - l6th March, 2011, Abuja, Nigeria.
10. Adamu, S.B Vandu, U, and Igwebuike, J.U (2000), Effects of graded levels of millet on the performance of Anak Giant broilers under the semi — arid condition of North Eastern Nigeria. *Book of Proceedings at the Faculty of*

Agriculture seminar series University of Maiduguri.

11. Kekeocha, C.C (1984)**.** Poultry Production handbook**.** Macmillan Publishers, London..
12. Abate, A.N and Gomez, M. (1983). Substitution of finger millet *(Eleusine coracana)* and Bulrush millet *(Pennisetum typhoides)* for maize in broiler. *Animals Feed Science and Technology,* 101**:** 247 -374
13. Ogundipe S.O Aduku, A.O Muazu, M.J, Oyelola A.A and Majidadi, N.B (1990). Replacement Values of Pearl Millet for maize in broiler ration. *Journal of Animal Production Research,* 10 (1): 57 - 65.
14. Adamu, S. B**,** Yaya, N and Alade, N.K (2001). Comparative study of three energy sources on performance and carcass characteristics of broilers under a sudano - sahelian environment. *Proceedings of 5th annual conference of Animal Science Association of Nigeria,* 17 - *19th* September 2001.
15. Dafur, B. S., Mbap, S. T and Butswat, I. S. R. (2008). Seasonal Pattern of Sheep helminthiasis on the Jos Plateau. *Journal of the League of Research in Nigeria,* 9 (1): 10-14.

Table 1: Ingredients and gross composition (%) **of experimental diets fed to birds at starter phase (2** — 5 **weeks)**

Level of Inclusion of yellow maize by "Gayamba" millet					
Ingredients	**0**	**25**	**50**	**75**	**100**
Yellow maize	51.41	38.56	25.71	12.85	0
Gayamba millet	0	12.85	*25.71*	38.56	*51.41*
Groundnut cake	30.59	30.59	*30.59*	30.59	30.59
Fish meal	4	4	4	4	4
Wheat offal	10	10	10	10	10
Bone meal	2	2	2	2	2
Limestone	1	1	1	1	1
Premix (starter)	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.3	0.3	0.3	0.3	0.3
Lysine	0.2	0.2	0.2	0.2	0.2
Total	100	100	100	100	100
Calculated Analysis					
Crude Protein **(%)**	23.31	23.64	23.51	22.41	23.82
ME(k/cal/kg)	2762.75	2709.30	2656.14	2427.28	2315.4
Ca **(%)**	1.19	1.19	1.19	1.20	1,20
P **(%)**	0.87	0.87	0.87	0.87	0.87
Ether Extract (%)	4.50	4.74	4.50	5.23	5.47
Crude fibre **(%)**	3.62	*3.45*	3.90	5.08	5.56

*The mineral vitamins premix contains the following per 2.5kg: Vitamin A 15,000, 00iu, Vitamin D^3 3,000 i.u.c.; vitamin E 20I.U, Vitamin K, 2500mg; Thiamine B_1 81, 2,000mg; Riboflavin, B_2 6,000mg; Pyridoxine, B_6 4,000mg; Niacin 4,000mg; Vitamin B_{12} 20mg; Pathothenic acid, 10mg; Anthioxidant *125mg;* Manganese 96mg; zinc 60mg; iron 24mg; copper 6mg; Iodine 1.4mg; Solenium 249mg; Cobalt 24mg.

Table 2: Ingredients and gross composition (%) of experimental diets fed to broilers at finisher phase (5 — **9 weeks)**

Level of Inclusion of Maize by Gayamba millet (%)					
Ingredients	**0**	**25**	**50**	**75**	**100**
Yellow maize	53.4	40.01	26.67	13.33	0
Gayamba millet	0	13.33	26.67	40.01	53.34
Groundnut Cake	23.66	23.66	23.66	23.66	23.66
Fish meal	4	4	4	4	4
Wheat offal	15	15	15	15	15
Bone meal	2	2	2	2	2
Limestone	1	1	1	1	1
Premix (starter)	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.3	0.3	0.3	0.3	0.3
Lysine	0.2	0.2	0.2	0.2	0.2
Total	100	100	100	100	100
Calculated analysis					
Crude protein (%)	20.40	20.50	20.65	20.80	20.91
ME (K/Cal/kg)	2653	2597	2542	2486	2431
Ca (%)	1.17	1.18	1.18	1.18	1.19
P (%)	0.87	0.84	0.81	0.78	0.75
Ether Extract (%)	3.90	4.15	4.40	4.66	4.91
Crude fibre (%)	3.39	3.60	4.70	4.53	6.92

Each 2.5kg premix contains the following; vitamin A 10,000,000iu; Vitamin. D_3 3,000iu; Vitamin K, 2.3g; Thiamine B_1 1.7g, Riboflavin B_2, 5.0g; Pyridoxine B_6, 3.lg; Vitamin B_{12}, 16mg; Biotin, 60mg; Niacin, 31.0g; Pathothenic acid, 8g; folic acid, 0.8g; manganese, 85g*;* zinc, 50g; iron, 25g; copper, 6g, iodine, 1.lg; selenium, 120mg, cobalt, 220mg; B.it.T, 60g; ethoxyquin, *65;* chloride, 200g

Table 3: Performance of broiler chickens fed diets containing varying levels of "Gayamba" millet during the starter phase (1 — 5 weeks)

Parameters	**Diets**					
	1	2	3	4	5	SEM
DFI (g)	59.71	*59.09*	*59.09*	*59.89*	59.49	0.43^{NS}
DWG(g)	20.97^{c}	22.33^{abc}	23.02^{ab}	21.45^{bc}	23.80^{a}	0.62*
FCR	2.86^{a}	2.66^{c}	2.58^{d}	2.80^{b}	2.50^{c}	0.08*
Mortality (No)	1	0	0	2	1	—

DFI = Daily feed intake, DWG = Daily weight gain, FCR = Feed conversion ratio, NS = Not Significant, SEM = Standard Error of the means, *P< 0.05, a, b, c means within the same row with different superscripts were significantly different.

Table 4: Performance of broilers fed graded levels of "Gayamba" millet based diets at the finisher phase (5 — 9wceks)

Parameters	Diets					
	1	2	3	4	5	SEM
DFI (g)	117.69	117.77	117.70	117.70	117.69	1.03^{NS}
DWG(g)	50.78	49.20	43.62	43.75	52.64	2.57^{NS}
FCR	2.39	2.41	2.67	2.71	2.24	0.15^{NS}
Mortality (No)	1	2	2	2	2	—

DFI = Daily Feed Intake, DWG = Daily Weight Gain, FCR = Feed Conversion Ratio, NS = Not Significant, SEM= Standard Error of Mean

Table 5: Overall performance of broiler chickens fed diets containing varying levels of "Gayamba" millet (1 - 9 weeks)

Parameters	1	2	3	Diets 4	5	SEM
DFI (g)	88.70	88.44	87.58	88.79	88.59	0.53^{NS}
DWG(g)	35.83	35.72	33.33	32.60	36.72	1.49^{NS}
FCR	2.63	2.53	2.63	2.54	2.38	0.32^{NS}
Mortality(No)	2	2	2	4	3	—

DFI — Daily feed intake, DWG Daily weight gain, FCR = Feed conversion ratio, NS = Not significant, SEM = Standard Error of Mean.

Table 6: Carcass characteristics, organ weights and gut (% body weight) of broiler chickens fed diets containing varying levels of "Gayamba" millet

Parameters	**Diets**					
1	2	3	4	*5*	SEM	
Live weight (kg)	2.16	2.11	1.96	1.99	1.88	0.15^{NS}
Eviscerated Wt (kg)	1.75	1.66	1.55	1.54	1.46	0.12^{NS}
Carcass weight (kg)	1.63	1.53	1.41	1.36	1.36	0.11^{NS}
Dressing (%)	73.99	73.22	71.8	68.43	72.42	1.49^{NS}
Head	2.71	2.93	2.89	2.83	2.89	0.14^{NS}
Leg	4.29	4.44	4.44	4.41	4.40	0.24^{NS}
Gizzard	2.49	2.63	2.67	2.66	2.45	0.17^{NS}
Liver	2.22	2.14	2.24	2.20	2.65	0.13^{NS}
Kidney	0.25^{ab}	0.19^{b}	0.24^{b}	0.20^{b}	0.35^{a}	0.04*
Small Intestine	5.05	4.59	4.40	4.80	4.82	0.32^{NS}
Large Intestine	0.20	0.26	0.30	0.24	0.32	0.05^{NS}
Pancreas	0.29	0.30	0.37	0.34	0.35	0.005^{NS}
Abdominal Fat	1.12	0.93	0.48	0.89	0.70	0.21^{NS}
Spleen	0.19	0.17	0.15	0.15	0.19	0.02^{NS}
Caeca	0.72	0.65	0.79	0.56	0.75	0.09^{NS}
Lungs	0.72	0.59	0.69	0.59	0.69	0.04^{NS}
Heart	0.52^{b}	0.53^{b}	0.53^{b}	045^{ab}	0.64^{a}	0.04*

***** P< 0.05, SEM standard error of the mean, NS = Not Significant.

Table 7: Cost of feed/kg live weight of grain of broilers fed graded levels of "Gayamba" millet based diets (1—9 weeks)

Parameters			**Diets**		
	1	2	3	4	***5***
Total Feed intake (kg)	4.97	4.98	4.90	4.97	4.96
Feed Cost (N/kg)	89.56	88.90	88.26	87.59	86.94
Cost of feed Consumed (N)	445.11	440.55	432.47	435.32	431.22
Total Weight Gain (kg)	2.01	2.00	1.87	1.83	2.06
Feed Cost LWG (~~N~~)	221.45	220.78	231.27	237.88	209.33
Savings	-	0.67	- 9.83	- 16.43	12.12

LWG = Live weight gain