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Carcass and Gut Characteristics of Broilers Fed Diets Containing Yellow Sorghum (*Sorghum bicolor*) Variety in Place of Maize

[1]M.S. Adamu, [1]H.I. Kubkomawa, [2]U.D. Doma and [3]A.T. Duduwa

[1]Department Of Animal Health And Production Technology Federal Polytechnic, P.M.B. 35, Mubi, Adamawa State-Nigeria
[2]Animal Production Programme, Abubakar Tafawa Balewa University,Bauchi, Bauchi State-Nigeria
[3]Post Primary Schools Management Board, Yola Adamawa State-Nigeria

Abstract: The study was conducted to evaluate the effects of diets containing graded levels of yellow sorghum variety on carcass and gut characteristics of broilers. In a completely randomized design, two hundred (200) Anak 2000 broiler chicks were allotted to five diets with four replicates of 10 chicks each per diet. In the diets, yellow sorghum replaced maize at 0, 25, 50, 75 and 100% levels in diets 1, 2, 3, 4 and 5 respectively. The diets and drinking water were provided *ad libitum* throughout the experiment which lasted for eight weeks. Dressing percentage, weights of Liver, Caeca, Abdominal fat and Pancreas were significantly ($P<0.05$) affected but there were no significant ($P>0.05$) dietary effects on other parameters measured. It was concluded that, use of yellow sorghum variety to replace maize up to 75% in broiler diets resulted in increased dressing percentage and weight of pancreas while abdominal fat and caeca weights were decreased. It could therefore, conveniently replace some percentages of maize in broiler diets or any monogastric livestock without any adverse effects on growth performance with low cost of feed per kg which in turn results in economic gain to the farmers and up lifting their standard of living.

Key words: Maize % Yellow Sorghum % Broilers % Carcass % Gut % Characteristics

INTRODUCTION

The effects of various energy sources on carcass and gut characteristics of broilers are well documented [1-5]. Maize has remained the chief energy source for poultry and other monogastric livestock. The demand for maize by man as food and other industrial uses coupled with it low production locally have placed additional constraints on its continual use in poultry diets. Furthermore, the low production and high cost of the crop may not be unconnected with scarcity of inorganic fertilizer and inadequate rainfall distribution. There is therefore, the need to look into alternatives for maize in poultry diets.

Yellow sorghum variety called *"kaura"* in hausa is a crop that yields better than maize under poor soil conditions and sparse (low) rainfall. It is used as a source of calorie in food mostly for the poorest and under privileged people [6]. It was tried as a total replacement of maize in broiler diets with good performance [7]. Some Sorghum varieties have high tannin content, group of compounds that bind proteins and impaired their utilization. Yellow sorghum variety is reported to have low levels of tannin [8].

The objectives of the study therefore, were to evaluate the effects of replacing maize with yellow sorghum variety as energy source on carcass and gut characteristics of broilers which is less documented in north- eastern Nigeria.

MATERIALS AND METHODS

The study was conducted at the Poultry Research Farm, Abubakar Tafawa Balewa University, Bauchi. Two hundred (200) day-old Anak 2000 broilers chicks (mixed sex) were allotted to five experimental diets in which yellow sorghum variety (Kaura) replaced maize at 0, 25, 50, 75 and 100% in diets 1, 2, 3, 4 and 5 respectively.

Corresponding Author: H.I. Kubkomawa, Department of Animal Health and Production Technology Federal Polytechnic, P.M.B. 35, Mubi, Adamawa State-Nigeria,
Tel: +07066996221, 07058055044.

Table 1: Ingredient and calculated composition of yellow sorghum (% based diets fed to broilers at the starter phase (0-4 weeks)

	Diets				
	Levels of replacement of maize by yellow sorghum				
Ingredients	(%)	(25%)	(50)	(75%)	(100%)
Maize	42.60	31.95	21.30	10.65	0.00
Yellow Sorghum	0.00	10.65	21.30	31.95	42.60
Roasted Soya beans	37.30	37.30	37.30	37.30	37.30
Fish Meal	5.00	5.00	5.00	5.00	5.00
Maize Offal	12.00	12.00	12.00	12.00	12.00
Bone Meal	2.50	2.50	2.50	2.50	2.50
Salt	0.25	0.25	0.25	0.25	0.25
*Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Calculated analysis					
Crude Protein (%)	23.00	23.11	23.32	23.32	23.42
M.E (Kcal/kg)	3003.18	2988.91	2974.64	2960.37	2946.10
Calcium (%)	1.16	1.16	1.16	1.16	1.17
Phosphorus (%)	1.06	0.98	0.91	0.833	0.76
Ether Extract (%)	8.98	8.87	8.77	8.66	8.55
Crude fibre (%)	3.55	3.55	3.55	3.55	3.55
Lysine (%)	1.40	1.41	1.42	1.43	1.45
Mehionine (%)	0.53	0.52	0.51	0.50	1.49

*Broiler Starter Premix from Pfizer Nigeria Ltd. Supplied per kg diet: Vit. A. 7,000 Iu. Vit. D3 1,500 in, Vit E.3 iu Vit. K 2mg, Riboflavin, 500mg, Panthothenic acid 6mg, Iacin 15mg. Chlorine 5mg Vit. B12, 0.08mg, Folic acid 4mg 8mg. Zinc 0.5 Iodine 0.1mg Co 1.2mg, Cupper 10mg, Iron 20mg.

Table 2: Ingredient and calculated composition of experimental finisher diets (%)

	Diets				
	Levels of replacement of maize by yellow sorghum				
Ingredients	(%)	(25%)	(50)	(75%)	(100%)
Maize	47.00	35.25	23.5	11.75	0.00
Yellow Sorghum	0.00	11.75	23.5	35.25	47.00
Roasted Soya beans	33.00	33.00	33.00	33.00	33.00
Bone Meal	2.50	2.50	2.50	2.50	2.50
Maize Offal	16.90	16.90	16.90	16.90	16.90
Salt	0.25	0.25	0.25	0.25	0.25
*Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Calculated analysis					
Crude Protein (%)	19.76	19.88	19.99	20.11	20.23
M.E (Kcal/kg)	3008.18	2993.04	2977.29	2961.55	2945.80
Calcium (%)	1.10	1.10	1.10	1.10	1.10
Phosphorus (%)	0.00	0.89	0.81	0.73	0.66
Ether Extract (%)	8.29	8.18	8.06	7.94	7.82
Crude fibre (%)	4.78	4.78	4.78	4.78	4.78
Lysine (%)	1.08	1.09	1.10	1.11	1.12
Mehionine (%)	0.43	0.42	0.41	0.40	0.39

*Broiler Finisher Premix from Pfizer Nigeria Ltd Supplied per kg diet: Vit. A. 7,000 Iu. Vit. D3 1,500 iu, Vit. E,3 iu. Vit. K 2mg Riboflavin, 500mg, Panthothenic acid 6mg, Niacin 15mg, Chlorin 5mg Vit. B12, 0.08mg, Folic acid 4mg. Mn 8mg, Zinc 0.5 Iodine 0.1mg Co 1.2mg, Cupper 10mg, Iron 20mg.

The ingredients composition and calculated analysis of the experimental diets for both starter and finisher phases are shown in Tables 1 and 2 respectively. Each treatment was replicated four times with 10 birds per replicate in a Completely Randomized Design (CRD). The diets were formulated to supply 23% and 20% crude protein in starter and finisher diets respectively and 3000 kcal/kg M.E. in both diets. The diets and drinking water were supplied *ad libitum.* throughout the period of the experiment (8 weeks). At the end of the experiment, ten birds were randomly selected from each treatment(two birds per replicate) and used for carcass and gut studies. The birds were fasted for 12 hours before slaughtering so as to allow for the emptying of the crop and excretion of the undigested feed residues. Each bird was weighed and slaughtered by slitting the throat, bled and plucked after scalding. Data were collected on carcass measurements (Plucked and Eviscerated weights, Dressing percentage and internal organs weights).

Data collected were subjected to analysis of variance techniques as outlined by [9]. Differences between treatment means were tested according to Duncan's Multiple Range Test, DMRT, [10].

RESULTS AND DISCUSSION

There were significant differences ($P< 0.05$) among the treatment diets for the dressing percentage, weights of liver, abdominal fats, caeca and pancreas while other parameters measured were statistical unaffected ($P>0.05$) as can be seen in Table 3. Birds on the diets containing yellow sorghum had statistically similar dressing percentages, which were significantly ($P< 0. 05$) higher than those on the control diet (100% maize). The results showed that replacing maize with yellow sorghum variety in broiler diets resulted in increased dressing percentage which could be because of higher protein content of yellow sorghum compared to maize. This result contradicts that of Ogbonna, [4] who obtained a significantly decreased dressing percentage in broilers with increase replacement values of Cassava leaf meal. However, Vantsawa, [2] and Abu [11] reported a non significant differences among dressing percentage of broilers fed different energy sources.

There were significant differences ($P<0.05$) in the weights of caeca of the birds fed the experimental diets. The results showed that as the dietary level of yellow sorghum increased, the weights of caeca decreased. The results are in agreement with that of Ogbonna, [4] who recorded significant decrease in weights of caeca

Table 3: Carcass and gut characteristics of broilers fed yellow sorghum as a replacement of maize

	Diets					
	Levels of replacement of maize by yellow sorghum					
Parameters	(0%)	(25%)	(50%)	(75%)	(100%)	SEM
Live weight	2162.5	1925.0	2000.0	2200.0	2200.0	86.54^{NS}
Plucked weight	1302.5	1750.0	1875.0	2025.0	1905.0	178.25^{ns}
Eviscerated weight	16.50.0	1600.0	16.50.0	1712.5	1600.0	178.25^{ns}
Carcass weight	1550.0	1500.0	1550.0	1612.5	1500.0	65.43^{ns}
Dressing percentage	66.35^{b}	77.76^{a}	77.45^{a}	73,35^{A}	68,70^{A}	2M78*
Gizzard weight	2.06	1.87	2.31	2.31	2.86	1.16^{ns}
Liver weight	1.17^{b}	1.21^{b}	2.76^{a}	1.86^{ab}	1.98^{ab}	0.29*
Lung weight	0.44	0.46	0.53	0.43	0.43	0.05^{ns}
Heart weight	0.40	0.39	0.52	0.43	0.43	0.05^{ns}
Spleen weight	0.10	0.12	0.18	0.13	0.14	0.03^{ns}
Small intestine weight	4.09	3.87	4.17	3.51	4.79	0.32^{ns}
Large intestine weight	0.22	0.25	0.26	0.21	0.21	0.03^{ns}
Abdominal fat weight	2.21^{a}	1.61^{b}	0.69^{c}	0.67^{c}	0.51^{c}	013*
Coecal weight	0.60^{a}	0.57^{b}	0.28^{b}	0.22^{b}	0.25^{b}	0.04*
Pancreas weight	0.25^{c}	0.45^{c}	2.31^{ab}	2.57^{a}	1.84^{b}	0.12*

A,b,c=Means in the same row with different superscript are significantly different

* = (P<0.05) ; NS = Not significant. SEM = Standard Error of the Mean.

with increasing levels of cassava leaf meal. However, Bamgbose, [12] recorded significant influence of using Tiger nut meal as a source of energy in broiler diets on weight of caeca. They attributed the increase in the weight of caeca to the high fibre content of the tiger nut.

Significant difference (P< 0.05) was recorded among the weights of liver. The results showed that birds fed 50% yellow sorghum base diet recorded the highest weight of liver, though similar to those of birds fed diets containing 75 and 100% yellow sorghum diets. However, birds on diets containing 0, 25, 75 and 100% yellow sorghum have similar weights of liver. The significant effect of the diets on the weight of liver agrees with the results of Ogbonna [4]. However, Vantsawa,[2] reported no significant influence of replacing maize with local maize offal in the diets of broilers on weights of liver.

There was a significant difference (P<- 0.05) among the weights of abdominal fat pad of the birds fed experimental diets. The results showed that diet 1 (100% maize) recorded the highest weights of abdominal fat pad. As the level of yellow sorghum increased, the abdominal fat decreased. The decrease in abdominal fat beyond 25% replacement of maize was very drastic. The significant decrease in the weights of abdominal fat pad with increase replacement levels of yellow sorghum variety might be due to lower level of fat in sorghum compared to that of maize. These observations also corroborate those of Moran [5] who reported increased abdominal fat accumulation of broilers with increase fat content of the diet. Abu [11] obtained a significant decrease in abdominal fat of glowing rabbits with increase in the dietary replacement of unprocessed sorghum (whole grain).

There were significant differences (P< 0.05) among the weights of pancreas of the birds fed the various diets. The results showed that birds fed diets containing 50 and 75% yellow sorghum recorded the highest weights of pancreas. While those on the control and 25% yellow sorghum had the least values. The results showed increase in the weight of pancreas with increase dietary level of yellow sorghum. Though beyond 75% replacement of maize, there was a slight decrease compared to the value obtained at 75%.

CONCLUSION

The use of yellow sorghum variety to replace maize up to 75% in broiler diets resulted in increased dressing percentage and weight of pancreas while abdominal fat pad and caeca weights were decreased which gave the best result in terms of weight gain and fed conversion ratio. The result of the study showed that yellow sorghum variety could conveniently replace some percentages of maize in broiler diets without any adverse effect on growth performance with low cost of feed per kg.

Recommendations: It is recommended that, yellow sorghum variety can conveniently substitute 75% of maize in broiler diets or any monogastric livestock with concomitant reduction in the cost of feed which in turn results in economic gain to the farmers and up lifting their standard of living.

REFERENCES

1. Yusuf, H.B., 2000. The effects of dietary energy-protein ratio on the performance of broilers. MSc. Thesis of Animal Production Programme, Abubakar Tafawa Balewa University, Bauchi-Nigeria.
2. Vantsawa, P., 1998. Replacement value of local maize offal of local maize offal (Dusa) for maize in broiler diets. MSc. Thesis, Department of Animal Science. Ahmadu Bello University Zaria-Nigeria.
3. Sizemore, F.G. and H.S. Siegal, 1993. Growth, feed conversion and carcass composition in female of our broiler crosses fed starter diets with different energy levels and energy to protein nation. Poultry Sci., 72: 2216- 2228.
4. Ogbonna, J.U., A.O. Oredien and A.K. Ige, 2000. Effects of varying dietary levels of cassava leaf meal in broiler gut morphology. Book of Proceedings 25th Annual Conference of Nigerian Society of Annual Production. 19-23 March 2000, Umudike-Nigeria.

5. Moran, E.T., 1986. Production and carcass quality responses of early and late marketed large toms to dietary fat during the finishing period. Poultry Sci., 61: 919- 924.
6. Asiedu, J.J., 1987. Processing Tropical Crops. The Macmillan Ltd London, pp: 189.
7. Adamu, M.S., W.D. Nafarnda, D.S. Iliya and H.I. Kubkomawa, 2006. Repacement value of yellow sorghum (*Sorghum bicolor*) for maize in broiler diets. Global J. Agricultural Sci., 5(2): 151-154.
8. Gualitieri, M. and S. Rappaccini, 1990. Sorghum grains in poultry feeding. World Poultry Sci. J., 46: 246-254.
10. Duncan, D.B., 1955. Multiple range and F-test. Biome Tries 11: 1- 42.
11. Abu, O.A., J.O. Akpodiete and J. Bakare, 1999. Comparative Effects of Unprocessed Sorghum as a Substitute for Maize Un the Diets of Growing Rabbits. Proceedings Of The 4th Annual Conference Of The Animal Science Association Of Nigeria, 14-16th September 1999, University Of Ibadan, Nigeria.
12. Bamgbose, A.M., S.O. Nwokoro, A.S. Mohammad, A.M. Musa and H.M. Olakulehn, 1998. Effect of tiger nut meal (*Cyperus rotundus*, L) on growth and carcass performance of broilers. Proceedings of Silver Anniversary Conference of MSA [/WASAP Inaugural Conference, March 21st -26th 1998, Nigeria.