Nig. J. Anim. Prod. 2020, 47(1):214 - 220
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Performance of broiler chickens fed diet containing fermented maize milling waste

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Abstract

Several efforts are being made to find the possibilities of utilizing agro-industrial by-products in poultry nutrition. The deployment of maize milling waste for feeding broilers has a promise for reducing its nuisance value, yet enhancing the feeding of broilers. An eight weeks' study was carried out with 108 day-old Anak broiler chicks, to evaluate the performance of broiler chickens fed diet containing maize milling waste as a replacement for maize. Maize milling waste was analyzed for its proximate composition. It was then used in formulating starter and finisher broiler diets at 0.0%, 10%, 30%, 50% dietary levels. The formulated diet was fed to the chicks in a Completely Randomized Design (CRD) experiment. The parameters evaluated were the initial body weight, final body weight, average feed intake, feed conversion ratio. The results obtained indicated that broiler chicks on 0.0% maize milling waste recorded the highest weight gain and feed conversion ratio followed by birds on 10% maize milling waste inclusion level. The feed intake of birds increased as the level of replacement increased. Birds on 50% milling waste had the highest feed intake which was significantly different (P<0.05) from the other treatment diets. From the results of this study, the growth performance in diet 1 (0.0%) maize milling waste inclusion level was superior to others, followed by diet 2 (10%) inclusion level. Therefore, for efficient utilization and without deleterious effects, 10% inclusion level of maize milling waste should be used in feed formulation.

Keywords: Performance, broiler chickens, fermented, maize, milling waste

Introduction

Maize milling waste is abundantly available in Nigeria and their unregulated disposal often constitute some nuisances to the environment. The level of animal protein intake in most developing countries of the world, including Nigeria is low. This is because of the high cost of conventional feed ingredients such as maize, soybean meal as well as the desire to diversify and expand the feed raw materials resource base for poultry ration formulation (Abeke *et al.,* 2008). Recently, much effort has been made to find the possibilities of utilizing agro-industrial by-products in poultry nutrition. This could lead to the reduction in the use of conventional feed ingredients and help reduce pollution problems, decrease feed cost and increase livestock production. Agro-industrial by-products represent a vast animal feed resource, which are largely unexploited (Onunkwo, 2017). These agro-industrial by-products can be of tremendous use in the livestock industry for feeding animals. Although considerable research efforts have been made and new researches are being conducted on the potentials of these by-products, very little effective practical application shave been achieved. The study was carried out to determine the replacement value of maize milling waste for maize as energy ingredient in broiler diets.

Location of study

The study was conducted at the Poultry Unit of the Teaching and Research Farm of the Michael Okpara University of Agriculture, Umudike, Abia State.

Umudike is located on latitude 05^{0}C 28' North and 07^{0}C 32'East and lies at an altitude of 122 m above sea level. This area is situated within the tropical rainforest zone of West Africa which is characterized by long duration of rainfall (April - October) and short period of dry season (November-March). Average rainfall is 2169.8mm in 148 – 155 rain days. Average ambient temperature is 26^{0}C with a range 22^{0}C and 30^{0}C. Its relative humidity ranges from 50 to 90%. These meterological data was obtained from the meteorological station at the National Root Crops Research Institute, Umudike Abia State (NRCRI, 2019).

Management and experimental birds

Four dietary treatment containing 0% fermented maize milling waste (T_1 control), 10% fermented maize milling waste (T_2), 30% fermented maize milling waste (T_3) and 50% fermented maize milling waste (T_4) were formulated (Table 1). The fermented maize milling waste was obtained from a maize processing unit in Umuahia, Abia State. The by-product was procured wet and sun dried for 5 days. The chicks were randomly distributed into 4 treatment groups of 30 broiler chicks per treatment with each treatment replicated 3 times in a Completely Randomized Design (CRD). Birds were raised in a deep liter system under the same environmental and management conditions which included provision of feed and water. The chicks were weighed at the beginning of the experimental and weekly thereafter. The experiment lasted for 8 weeks. The pens were washed and disinfected two weeks prior to arrival of the chicks. Vaccination and medication procedures were strictly adhered to. The chicks were brooded on wood shavings. Heat was supplied using lamps and electric light and was adjusted weekly to control (reduce) the heat. The maize milling waste was subjected to proximate chemical analysis (Table 2) to determine its crude protein, crude fiber, ether extract, nitrogen free extract and ash content according to AOAC (1990). The metabolizable energy was estimated according to the equation of Morgan *et al.* (1975).

Table 1: Gross composition of broiler chickens diet fed fermented maize milling waste

	Treatment			
Ingredients	T1(0%)	T2 (10%)	T3 (20%)	T4 (50%)
Maize	53.00	47.70	42.40	26.50
Milling Waste	0.00	5.30	10.6	26.50
Fishmeal	3.00	3.00	3.00	3.00
Soybean	30.00	38.5	38.5	38.5
Bone meal	2.50	2.50	2.50	2.50
Palm kernel cake	11.00	11.00	11.00	11.00
Common Salt	0.25	0.25	0.25	0.25
Vt/Min	0.25	0.25	0.25	0.25
TOTAL	**100**	**100**	**100**	**100**
Crude protein	22.57	22.10	21.57	21.19
Me kcal/kg	2891.00	2869.18	2844.86	2836.23

Data collection and analysis

Daily feed intake was determined by the difference between the quantity of feed offered the previous morning and the quantity of left-over the following morning. Total weight gain was determined by obtaining the difference between initial weight and the final weight. Data collected were subjected to Analysis of variance (ANOVA) (Steel and Torrie, 1980) and where differences were significant; means were separated with the Duncan's Multiple

Range Test (Duncan, 1955).

Results and discussion

The proximate value of fermented maize milling waste is shown in Table 2 while data on performance characteristics are presented in Table 3. The proximate composition of fermented maize milling waste revealed a lower in metabolizable energy (1781.52 kcal/kg) when compared with the value of 3440kcal/kg reported for maize (Obioha 1992). However, the energy content of the diets numerically decreased as the level of replacement increased because maize milling waste contained less energy than maize. There seemed to be no more difference between ash and crude fat content of the formulated diets. The crude fibre value for maize milling waste at 10.80% higher than the reported value of 2.7% for maize by (Aduku, 1992). The crude protein value of the maize milling waste at 12.50 was also higher than that of maize, which ranges from 8.9-10.0% (Obioha 1992; Aduku, 1993). The crude fibre content increased with increase in the level of replacement of maize with maize milling waste. This was probably because maize milling waste contains more protein and fibre than maize.

The negative relationship between dietary fibre and nutrient digestibility tended to agree with the report that high fibre content of diet hindered efficient digestibility of nutrient (Gupta *et al.* 1973; Sosulki and Cadden,1982; Feliz *et al.,* 1990 and McDonald *et al.,* 1995). This result also agrees with the findings of Tegea *et al.* (1997) and Adegbola and Okonkwo (2002) that digestibility of nutrients decrease with increase in dietary fibre in different maize replacement studies. It further confirmed the statement that the digestibility of a feed is closely related to its chemical composition, especially the fibre fraction of the feed (Feliz *et al.*, 1990; McDonald *et al*, 1995; Dung *et al.*, 2002). The higher dietary fibre in the diets might have been responsible for this result, probably by reducing the digesta (passable) time, thereby not allowing enough time for proteolytic enzyme and peptidase to hydrolyze the protein components of the diets (McDonald, 1995).

Table 2: Proximate composition of experimental diets (% dry matter)

Parameters (%)	T1	T2	T3	T4
Dry matter	86.50	85.80	86.50	21.90
Crude protein	17.66	19.28	22.16	23.30
Crude fibre	1.07	1.15	1.18	1.34
Nitrogen free extract	68.00	65.10	63.24	61.46
Ether extract	2.38	2.19	2.33	2.38
Ash	1.53	1.19	1.23	1.31

The growth performance of broiler birds fed with different levels of fermented maize milling waste is shown in Table 3. There was significant ($P<0.05$) difference for all parameters considered except for feed intake. The broiler chickens showed a gradual depression in final body weight gain with increasing level of maize milling waste in the diet. However, the control diet was significantly ($P<0.05$) higher than all the diets containing maize milling waste.

Table 3: Proximate composition of fermented maize milling waste (% dry matter)

Parameters (%)	
Dry matter	88.50
Crude protein	12.50
Crude fiber	10.75
Nitrogen free extract	47.67
Ether extract	5.75
Ash	5.10

The birds fed 10% maize milling waste recorded a significantly (P<0.05) higher average daily body weight gain than birds on 30.0% and 50% maize milling waste. Feed intake on 0.0% maize milling waste showed no significant (P<0.05) difference from 10%, 30% dietary levels of maize milling waste meal. But the feed intake on 30% dietary level of maize milling waste was significantly (P<0.05) different. The feed intake of the birds increased as the level of replacement increased. This trend of result was probably because the dietary energy was reduced with increase in level of replacement and the birds on lower dietary energy density ate more to satisfy their energy needs (Olomu, 1995; Ojewola *et al.,* 2003). This pattern of feed intake was in agreement with what was reported by many authors (Esonu and Udedibia, 1993; Ajaja *et al.,* 2002; Lamidi, 2003; Ugwuene *et al.,* 2005).

The numerical values of feed conversion ratio obtained in this study increased with increase in level of replacement. The lowest feed conversion ratio (FCR) of 1.57 was recorded by birds on 0.0% (control) maize milling waste, there were significant (P<0.05) differences between the treatment groups. The feed conversion ratio on 50% was high followed by 30%, 10% and 0.0% dietary level of maize milling waste.

It implies that the control diet was superior to other since the lower the (FCR) the more superior the diet and this may be due to efficient utilization of nutrients in terms of digestion, absorption and assimilation (Bamgbose *et al*, 1998).

Table 4: Growth performance characteristics of broiler chickens fed fermented maize milling waste

	Treatment				
Parameters	T1	T2	T3	T4	SEM
Initial Body Weight (g)	52.73	52.50	52.57	52.87	0.27
Final Body Weight (g)	1703.61	1518.02	1362.41	1333.03	28.87
Total Weight gain (g)	1650.88	1465.52	1309.84	1280.16	28.88
Av. Daily Body Wt. gain (g)	29.48^{a}	26.17^{b}	23.39^{c}	22.86^{d}	0.82
Av. Daily Feed Intake (g)	46.27^{c}	46.29^{c}	46.76^{bc}	46.96^{a}	0.11
Feed conversion ratio	1.57^{d}	1.76^{c}	1.93^{b}	2.08^{a}	0.10
Mortality rate	0.00	0.00	0.00	0.00	0.00

^{abc} Means on the same row with different superscripts are significantly (p<0.05) different.
SEM = Standard error of mean

Conclusion

Findings from this study showed that fermented maize milling waste should not exceed 10% inclusion level in broiler chicken ration formulation, also should not be used on brooding stage of broiler production.

References

Abdesamine, R. E., Ranaweera, K. N. P and Mario, W. E 1983. The effects of fibre content and physical texture of the diet on the performance of broilers in the tropics. *Broiler poult Sci.* 24:383-389.

Abeke, F. O. and Otu, M. 2008. Anti-nutrients in poultry feed. In proceedings of the 13th annual conference of animal science association of Nigeria (ASAN). Sept. 15th-19th ABU, Zaria 396-399.

Adegbola, T. A. and Okonkwo, J. C. 2002. Nutrient intake, digestibility and growth rate of rabbits fed varying levels of cassava leaf meal. *Nigerian journal of animal*

production. 29 (1). 21-26.

Adejinmi, O. O., Babatunde, B. B., Olupona, J. A., Oyadeyi, S. O., Alphonso, O. and Adeniyi, A. B. 2003. Performance and nutrient digestibility of rabbits fed fermented and unfermented cocoa pod husk. *Proc. of 28th annual conf. of NSAP*. Pp. 243-246.

Aduku, A. O. 1993. Tropical feedstuff analysis table. Department of animal science. Ahmadu Bellow University, Samaru, Zaria.

Akinmutimi, A. H. 2004. Evaluation of sword bean (*Canavalia gladiata)* as an alternative feed resource for broiler chickens. PhD thesis, Michael Okpara University of agriculture, umudike.

Akinmutimi, A. A. 2006. Nutritive value of raw processed jack fruit seeds (*Artocarpus hterophilus*) chemical analysis. *Agricultural journal* 4:266-271.

Alawa, J. P. and Unwana, N. N. 1993. Alternative feed formulation in developing countries: prospects of utilization of agro-industrial by-products. *Journal of animal production res* 13(12): 53-87.

Amaefula, K. U., Abasiekong, S. F., Onunkwo, D. N. and Onwudike, O. C. 1999. Performance of grower pigs fed diets containing different proportions of palm kernel meal and wheat breasted bronze and Beltsville small white turkeys. World poultry science journal. 7(2):103-106.

AOAC 1990. Association of official analytical chemists. Official methods of analysis (15th edition) Washington DC, USA. Aviagen, Ross Poultry Breeders, Ross 308 broiler management guide nutrition supplement 2007.

Bamgbose, A. M. 1998. The effect of replacing groundnut cake with cotton seed cake on the performance of broiler chickens. *Nig. Jour. Anim. Prod*. 25 (2): 145-152.

Duncan, D. B. 1955. Multiple range and multiple T. test. Biometrics 11:1-42.

Dung, N. N. C., Manh, L. H. and Uden, P. 2002. Tropical fibre sources for pigs digestibility. Digesta retention and estimation of the fibre digestibility in vitro. Animal feed science and technology. 102:109-124.

Esonu, B. O., and Udedibie, A. B. I. 1993. The effect of replacing maize with cassava peel meal on the performance on weaned rabbits. *Nigeria Journal of Animal Production*. 20:81-83.

Felix, A., Hill, R. A. and Diara, B. 1999. In vitro and vivo digestibility of soyabean straw treated with various alkalis. British Society of Animal Production.

Frandson, R. D. 1981. Anatomy and physiology of farm animals, *3rd edition. Published Bailliere, Tindall, London*, Pp. 62-94.

Gupta, B. S., Johnson, D. E., Hinds, F. C., Minor, M. C. 1973. Forage potential of soybean straw agronomy journal. 65:538-581.

Igwubuike, J. U. Kwari, I. D. and Usman, Y. 2003. The replacement of maize with gain residue in concentrated diets in growing rabbit. *Proc. 8th Ann. Conf. Animal Science Association of Nigeria, Minna, Nigeria*.

Iyayi, E. A. 2002. Effect of raw and processed Mucuna (Mucuna pruriena) seed meal on the performance and egg qualities of

laying hen. *Proc. 7th Conf. Ani. Sci. Ass. Of Nigeria Uni of Abeokuta, Nigeria.* Pp. 167-169.

Latymer, E. A. Low, A. G. and Woodley, S. C. 1985. The effect of dietary fiber on the rate of passage through different sections of the gut in pigs: Just A. Jogensen, H., Fernandez, J.A. (eds). *Digestive physiology of the pig, National Institute of Animal Science, Copenhagen,* Pp. 215-218.

McDonald, P., Edwards, R. A., Green Halgh, J.F.D., and Morgen, C. A. 1995. Animal nutrition, *5th edition. Longman scientific and technical, England*, pp. 221-237.

Morgan, D. J., Cole, D. J. A. and Lewis, D. 1975. The relationship between digestible energy, metabolizable energy and total digestible nutrient value of a wide range of feedstuffs. *Journal of Agricultural Science, Cambridge*, 84:7-17. Department of Agriculture, Himarchal Pradesh (2001).

Mustapha, G. C. and Tunde, O. 1990. Performance of broilers given different dietary levels of Acasia siberiana (D.C) Var siberiana seeds. *Nigerian Journal of Animal Production*. 17-55.

Nwosu, S. O. C. 1987. Nutritional evaluation of traditional based feeds. *B.Agric. Tech. project report. Federal University of Technology, Owerri, Nigeria*.

Obioha, F. C. 1992. A guide to poultry products in the tropics. Acne publishers, Enugu, Nigeria.

Ojewola, G. S., Oguike, M. A., Akomas, S. C., Likita, Tn, Onyiro, O. M. and Wokocha, C. 2003. Comparison of the supplementary effect of roxazyme genzyme in palm kernel meal and brewer's dried grain diets fed to male turkey poults. Nigeria agricultural journal. 34:116-124.

Okah, U. 2004. Effect of dietary replacement of maize processing waste on the performance of broiler starters. *Proc. 9th annual sci. Aso. Of Nigeria (ASAN) Abakiliki*, Sept. 13-16.

Okorie, S. U. and Amaechi, E. U. 2003. Effects of roasting and soaking on the proximamte composition of and functional properties of selected tropical legumes. *Global journal of pure and applied sciences.* 9(12): 177-182.

Olomu, J. M. and Oboh, S. O. 1995. Pig production in Nigeria: Principles and practices. *Jachem publishers, Benin City, Nigeria*.

Oluyemi, J. A. and Robert, F. A. 1985. Poultry production in warm wet and climates. 1st edition, published by *macmillan publishers Ltd. London*. Pp. 124-140.

Oluyemi, J. A. and Roberts, F. A. 1985. Poultry production in warm wet climates. *Macmillan press Ltd, London*. Pp. 195-199.

Onunkwo, D. N 2017. Dietary inclusion of Direct fed microbe on the growth performance of broiler birds. *The Nigerian Agricultural Journal*. 48 (1): 199-205

Onwudike, O. C. 1986a. Palm kernel as a feed for poultry 1. Composition of palm kernel and availability of its amino acids in chicks. *Animal Feed Science Technol*. 16:179-186.

Onwudike, O. C. 1986b. Palm kernel as a feed for poultry 2. Diets containing palm kernel meal for starter and grower pullets. *Animal Feed Science Technol.* 16, 187-194.

Sosulki, F. M. and Cadden, A. M. 1982. Composition and physiological properties of several sources of

dietary fiber. J. Feb. Sci. 47:1472-1476.

Steel, F. G. and Torrie, J. H. 1980. Principles and procedures of statistics. A biometric approach and edition. *McGraw Hill Book Co*.

Teguia, A., Njiwe R. M., Nguekouo F. C. 1997. Effects of replacement of maize with dried leaves of sweet potato (Hyponoea batatas) and perennial peanuts (*Arachis glabrata Benth*) on the growth performance of finishing broilers. *Animal feed science technology* 66.

Uchegbu, M. C., Etuk E. B. and Okoli, I. C. 2003. Evaluation of maize offal as a feed ingredient in broiler finisher rations. *J. Sust. Agric. Res*. 74-76.

Ugwuene, M. C. and Omoehi, J. O. 2000. Comparison of fish and chicken infestation meal as animal protein sources in broiler diets. *Journal of sustainable agriculture and the environment, MOUA Umudike*. Pp. 20-25.

Ukachukwu, S. N., Oyewola, G. S., Abasiekong, S. F. and Uzuegbu, C. P. 2003. Biologic and economic effects of including different agro-industrial by-products in turkey poult diets. *Nig. Agric. J*. 34:138-142.

Received: 30th August, 2019
Accepted: 20th February, 2020