Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.4, No.26, 2014

Improving the Utilization of Sorghum Spent Grain (Pito Mash) in Broiler Diets by Treating with Plantain Peels Ash Extract

Asare-Bediako Ankrah Esther Abandoh-Sam Samuel Nyantakyi
Valley View University-Techiman Campus, Department of Agribusiness. Techiman-Ghana

Abstract
Two hundred and forty day-old broiler chicks were used in an experiment to evaluate the effect of different inclusion levels of alkali-treated Pito mash (ATPM) on carcass characteristics and growth parameters. The chickens were grouped into 4 dietary treatments of 60 chickens per grouped, tagged T1, T2, T3 and T4. T1 was the control (non-ATPM). T2, T3, T4 contained 5, 10 and 15 % inclusion level of alkali - treated Pito Mash (ATPM) respectively. Each treatment replicated three times. Six chickens from each treatment were randomly selected and fasted for 12 hours for carcass analysis. The results indicated that chickens fed with the alkali-treated diets did show significantly ($P > 0.05$) difference in some carcass parameters evaluated; such as live weight, dressed weight, back weight, thigh weight, liver and wing weight, however, significant ($P<0.05$) variation in other parameters such as dressing percentage, breast weight, leg weight, neck weight, head weight and gizzard weight were observed. Weekly weight gain, live weight and dressed weight were also not significantly ($P>0.05$) influenced by the dietary treatments but appeared to vary numerically across the treatments. Alkali -treated pito mash up to 15% inclusion level in the diets of broiler chickens (Starter and Finisher) could be applied for production without any adverse effects on the growth performance and carcass quality.
Keywords: Alkali- pito mash, Carcass qualities, dressing percentage and Growth parameters

INTRODUCTION

Available records indicate that the consumption level of animal protein per head of population is much greater in developed country, than in developing countries (Smith, 2001). This deficiency could be minimized if not completely eradicated, by broiler chicken production, provided that constraints militating against the poultry industry in developing countries, especially feed cost and nutrition are addressed with all the seriousness it deserves. Aho (2011) reported that the two biggest challenges facing the poultry industry are grain and energy prices as a results of shortage due to competition with man as grains are used as the main staple of food and maize being used to manufacture ethanol in certain part of the world.

Anning (2008) indicated that the least cost of production of egg and chicken meat rose from G₵367.3 to G₵762.0 and G₵10.53 to G₵17.378 respectively from 2003 to 2004 in Ghana. As a means of relief to poultry farmers, research has shown that unconventional feedstuff such as Agricultural and Industrial by-products could be better alternative as feed ingredients for monogastric nutrition such as poultry and pig. This has become necessary because by-products do not serve as diets for human beings, thereby providing no competition between human and livestock enterprise.

Among such Agricultural and Industrial by-products mostly thrown away, but has been found useful in feeding livestock and poultry is sorghum spent grain, locally known as 'pito mash'- a by-product from locally brewed sorghum grain gin known as 'pito'.

The essentiality of including pito mash in poultry diets is its nutritional content, availability, low price and non-competiveness. For instance, Couch (1978) and Ewing (1965) found that the dried brewers grains has 20% crude protein, about 6% ether extract, over 15% crude fiber, and about 4% ash. Adeyeye and Ajewole (1992) reported that the sorghum pito mash contains 24.29% crude protein, 15.58% crude fiber and 8.90% ether extract. However, its high fibre content limits its inclusion levels in poultry diets. This anti-nutritional content seemed to have been minimized by pre-digesting the pito mash with organic alkaline extract such as yam peel ash extract, before incorporating into broiler diets.

The objective of this study is therefore to assess the performance of chicken broilers fed diets containing various levels of alkali-treated pito mash.

MATERIALS AND METHODS

The study was conducted at the poultry unit of the Agribusiness Department of Valley View University-Techiman Campus. The alkali-treated pito mash was prepared by treating 50g of the dried pito mash with 1.5L of yam peel ash extract. This ratio was used as the baseline for preparing large quantities of treated pito mash for use in the subsequent feeding trials. A grower (2-5weeks) and finisher (6-8weeks) diets were prepared using the following ingredients: maize, alkali-treated pito mash, wheat bran, fish meal, soya bean meal, palm oil, oyster shells, dicalcium phosphate, vitamin premix, methionine + lysine and common salt. Each of the diets consisted of four dietary treatments containing 0, 5, 10 and 15 % of the treated pito mash (Tables 1 and 2). The diets were

formulated to be isocaloric (2850 and 2660 kcal/kg ME) and isonitrogenous (21.8 and 19.3%) for grower and finisher respectively. Palm oil was added primarily to balance the energy levels as the energy content of the alkali-treated pito mash were much lower than maize it replaced partially.

Data collection

The quantity of feed and water supplied to each replicate were recorded. From the data, the feed residue and the water leftover were subtracted from the quantity supplied to calculate the weekly feed intake and daily water consumption. Based on the feed intake data, the average daily feed intake /day/chicken was determined by dividing weekly feed intake by 7 days.

Body weight changes

Before the commencement of the experimental diets, the initial body weights were taken after the chickens were fasted for 12 hours, by withdrawing feed only. This was done to remove gut content which might inflate the actual live weight of the chickens. The chickens were subsequently weighed every week until the experiment was terminated at 8 weeks of age.

Carcass analysis

At the end of the broiler finisher phase (8 weeks), two chickens representing 6 chickens from each treatment were randomly selected, fasted for 12 hours and weighed. They were slaughted by making a clean cut through the carotid arteries and jugular veins in the neck with a sharp knife and allowed to breed completely. They were defeathered, eviscerated, and cut into breast, thigh, back, neck, wings, legs, head and the visceral organs (liver and gizzard) as indicated by Kleczek et al (2007), weighed and expressed as percentages of the live weights

STATISTICAL ANALYSIS

The data were subjected to analysis of variance according to Genstat discovery system software (2013) computer program. Probability value < 0.05 was taken to indicate statistical significance. The treatment means were compared using the least significant difference (Lsd).

RESULTS and DISCUSSION

Table 1. Composition of the experimental diet for growers (2-5weeks)

Ingredients	**Inclusion levels of treated pito mash**			
	0 %	**5%**	**10%**	**15%**
Maize	53	48	42.50	38
Treated Pito Mash	0	5	10	15
Wheat bran	12	12	12	12
Fish meal	10	9	8.5	7
Vegetable oil	3	4	5	6
Soya bean meal	19	19	19	19
Dicalcium phosphate	1	1	1	1
Oyster shell	1	1	1	1
Methionine + Lysine	0.50	0.50	0.50	0.50
Salt	0.25	0.25	0.25	0.25
Vit premix	0.25	0.25	0.25	0.25
Total (Kg)	**100**	**100**	**100**	**100**
Calculated values				
Crude protein (CP)	21.57	21.77	22.3	22.2
Metabolizable Energy(ME)	2923	2910	2894	2886

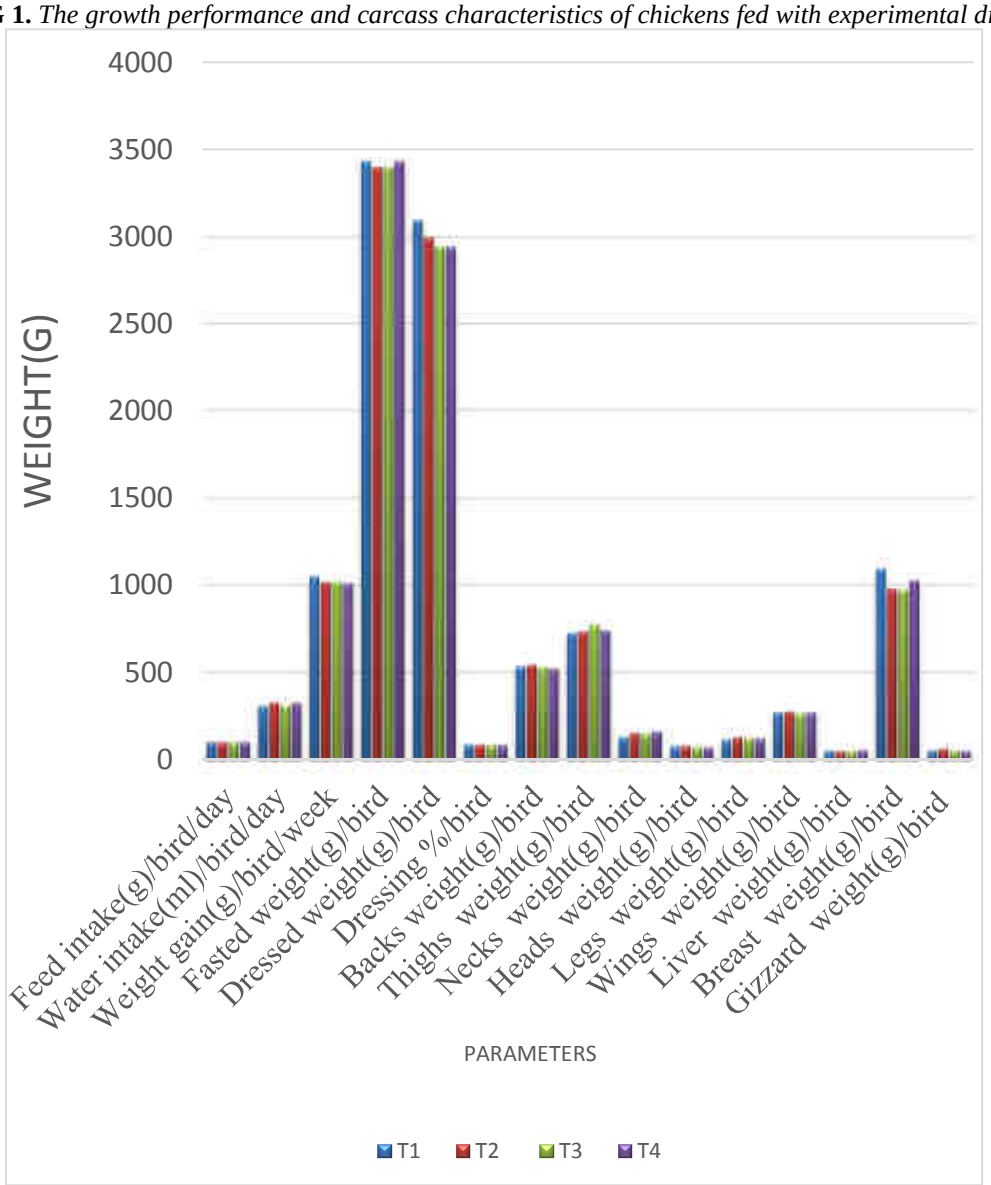
Table 2. Composition of the experimental diet for finisher (6-8 weeks)

Ingredients	**Inclusion levels of treated pito mash**			
	0 %	**5%**	**10%**	**15%**
Maize	53	49	45	40
Treated Pito Mash	0	5	10	15
Wheat bran	17	17	17	17
Fish meal	8	6.5	5	4
Vegetable oil	2	2.5	3	4
Soya bean meal	15	15	15	15
Dicalcium phosphate	0.75	0.75	0.75	0.75
Oyster shell	2	2	2	2
Methionine + Lysine	0.75	0.75	0.75	0.75
Salt	0.75	0.75	0.75	0.75
Vit premix	0.75	0.75	0.75	0.75
Total (Kg)	**100**	**100**	**100**	**100**
Calculated values				
Crude protein (CP)	19.22	19.19	19.15	19.30
Metabolizable Energy(ME)	2747	2715	2678	2665

Table 3. The growth performance and carcass characteristics of chickens fed with experimental diets

PARAMETERS	T1 0%	T2 5%	T3 10%	T4 15%	SEM	SIGN
Feed intake(g)/bird/day	104.2	104.23	104.27	105.5	0.097	*
Water intake(ml)/bird/day	310	328	311	327	8.08	*
Weight gain(g)/bird/week	1051	1018	1020	1012	65.3	NS
Fasted weight(g)/bird	3433	3400	3400	3433	157.2	NS
Dressed weight(g)/bird	3097	3000	2946	2946	105.7	NS
Dressing %/bird	90.2	88.2	86.6	85.7	1.856	*
Backs weight(g)/bird	535	544	531	521	31.5	NS
Thighs weight(g)/bird	731	740	779	745	21.9	NS
Necks weight(g)/bird	133	156	154	163	7.50	*
Heads weight(g)/bird	81	82	75	73	3.36	*
Legs weight(g)/bird	118	130	127	124	4.83	*
Wings weight(g)/bird	271	278	269	272	9.66	NS
Liver weight(g)/bird	55	51	53	54	4.93	NS
Breast weight(g)/bird	1093	980	973	1028	67.6	*
Gizzard weight(g)/bird	57	65	55	54	3.01	*

FIG 1. *The growth performance and carcass characteristics of chickens fed with experimental diets.*



The increased in feed intake/chicken/day did not agree with Yaakugh *et al*. (1994) who observed a linear decreased in feed and water intake as the levels of maize replaced by alkaline treated Brewers dried grains(ATBDG) increased. Dairo (1999) also observed significantly increased in average daily water and feed intake as the level of sorghum distiller's waste inclusion level increased in the diets. The general increased in feed and water intake of chickens across the treatment groups with increased dietary level of ATPM could be attributed to the increased crude fiber content of the diet. This might have reduced the metabolizable energy of the diets, as the test ingredient increased. Thus chickens had to increase their feed intake to satisfy their energy requirements.

There was no significant difference in weight gain/bird/week diet across treatments, although there were differences numerically. This agrees with Adua *et. al.* (2012) who observed no significant difference in weekly weight gain of broiler chickens fed with alkali-treated groundnut shell meal above 10%. The rate of weight gain has to do with the feed intake and utilization. Although the feed intake increased with corresponding increased of the test ingredient, but there were no corresponding weight gain statistically ($P > 0.05$). The dressed weight showed statistically no difference ($P > 0.05$) but slightly reduced numerically with corresponding incremental levels of ATPM. This agrees with Adua *et. al.* (2012) who observed no significant difference but a downward trend numerically with corresponding incremental ATPM inclusion in broiler chicken diets. This could mean that dietary nutrients are diverted from the growth of edible carcass to the accretion of intestinal and visceral organs.

The decreased in the dressing percentage as the inclusion of ATPM increased is in agreement with Dogari (1978) who observed a downward trend of dressing percentage as alkali-treated sorghum distillers' waste inclusion increased in broiler chicks, even though, feed intake increased as the (ATPM) inclusion level increased.

Incorporating ATPM in the diets significantly ($P < 0.05$) reduced the weight of the liver of chickens. However, there was a significance difference ($P < 0.05$) in gizzard weight. The chicken on 5% had the highest gizzard weight than the other treatments. increased. This could imply that the 5% ATPM inclusion level might be the optimum dietary fibre to enhance digestion to improve the weight of the gizzards which are deeply involved in digestion.

The result of the effect of ATPM on some cut parts (back, thigh, and wing weights) did not vary significantly ($P>0.05$) across the dietary treatments. This confirms the findings of Isikevenu *et al.* (2010) who evaluated the effects of replacing groundnut cake with urea-treated and fermented brewer's dried grains fed broiler finishers and observed that all the carcass parameters evaluated were not significantly affected by the treatment. However the breast, leg and neck weights showed a statistically significant ($P<0.05$) difference. This is in conflict with the findings of Isikevenu *et al.* (2008) who observed that all the carcass parameters evaluated were not significantly affected by the treatment. Though, the differences could not be understood, however, it could be said that the deposition of nutrients in these parts, might have accounted for the difference

CONCLUSION AND RECOMMENDATION

Based on the conditions of this experiment, supplementing alkali-treated Pito Mash in the diets of chickens is recommended up to 15% inclusion. This is because the dietary treatments did not affect negatively the health status and body of the birds which is the greatest interest of Ghanaian farmers.

Acknowledgement

The Authors would like to express their grateful thanks to the Rector of the Valley View University-Techiman Campus as well as the immediate past Rector, Prof J. K. Osei for their support, encouragement, providing us with facilities and equipment to carried out and published this article.

Reference

Adeyeye A, Ajewole K (1992). Chemical composition of cereals in Nigeria. Food Chem. 44: 41-44

Adua M. M., Alu S. E, Thani R,J. Abubakar H.T and Mathew U.D. (2012) Effect of different alkali-treated groundnut shell meal on blood parameters and meat yield of broilers finisher chickens. Journl. of Agriculture Science vol. 2 (9) pp.224-230.

Aho, P. (2011) saving cost with alternative ingredient. World poultry – chicken, document vol. 25 № 2

Anning (2006) Poultry Sector Country Review. FAO Animal Production and Health Division. August 2006, Re – edited August 2008, Ghana.

Smith, J. A. (2001). Poultry.The tropical Agriculturalist rev. edn.CTA Macmillan University of Edinburgh U. K. pp. 1-8.

Couch, J.R. (1978). Brewers dried grains in poultry feed. Poultry international, July, 42

Dogari, M. (1985). Evaluation of Local Sorghum Beer Residue in Broiler Chickens. Unpubl. Msc. Thesis, ABU Zaria.Pp. 103

Dario, A. S. (1999) The influence of sorghum distillers waste on the performance of pigs. Nigeria Journ. Of Animal Prod. Pp. 308

Ewing, W. R. (1965). Poultry Nutrition.5th edn.Ray Ewing Co., Pasadena, California. Pp. 396 – 418.

Isikwenu, J. O, Akpodiete, O. J, Omeje, S. I and OKAGBARE, G, O (2008) Effects of replacing groundnut cake with untreated and fermented brewer's dreid grain in broilr chicks diet Anim. Research Int. 5(1): 795-800.

Kleczek, K, Wilkiewicz-Wawro, E, Wawro, J, Makowski, W (2007). Effect of body weights of day-old Muscovy ducklings on the growth and carcass traits. Arch. Tier. Dumm-merstorf, 2,204-213.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar