

THE USE OF ACTIVATED SEWAGE SLUDGE IN BROILER DIETS

W.O.BIOBAKU, A.B.J.AINA, AND A.O. SHOGE

College of Animal Science and Livestock Production, University of Agriculture, PMB 2240, Abeokuta, Nigeria.

Received 30 December 1998; Accepted 23rd April 1999

ABSTRACT

The effect of dried activated sewage sludge on the growth and protein utilization of broilers was studied. The eight weeks feeding trial involving one hundred and eighty day-old broiler chicks, weighing 57.80 - 58.00g in a completely randomised design were fed three diets containing 0% (control), 10% and 15% dried activated sewage sludge. The dried activated sewage sludge was found to be high in protein and ash (24.24% and 41.80%) but low in ether extract and fibre (3.0% and 3.50%) respectively.

At the 10% level of inclusion in the diet, the activated sewage sludge gave significantly ($P < 0.05$) better weight gains than the control and 15% levels of inclusion. The feed efficiency and protein efficiency ratios were also significantly ($P < 0.05$) better at 10% inclusion when compared with the control and 15% levels of inclusion. There was no incidence of enteritis and percentage mortality was statistically insignificant at 5% level.

Key words: Broilers, sewage sludge, growth, protein utilization.

INTRODUCTION

Animal protein is essential in human nutrition because of its biological significance, so it should be the aim of the government to pursue a policy that will ensure that attainment of 35g caput per day of animal protein recommended by FAO (1982).

In order to meet the increased demand in animal protein, non-conventional meat sources, suitable for production by household or small scale farmers need to be introduced. Broiler, rabbit and fish production are examples of such alternatives. The production of these livestock is however bedevilled by problems of inadequate and high cost of feed ingredients brought about by the very

stiff competition between man and monogastric animals. The inclination now is to utilize unconventional or lesser used or recycled waste materials in the feeding of these stock such that the production cost will be greatly reduced. One such unconventional feed material is activated sewage sludge. Manure from livestock production has been shown to be a potential source of feed nutrients (Cheeke, *et al.*, 1977; Muller, 1980; Shah and Muller, 1982). Both livestock manure and municipal waste can be recycled and fed to animals and these, besides serving as nutrients, minimize environmental problems.

Some workers have reported the beneficial effects of activated sewage sludge on the growth of some classes of livestock (Firth and Johnson, 1955; Scott and Adams, 1975; Ekpenyong and Biobaku, 1986) while the beneficial value of dried poultry manure on livestock production has also been established (Ogunmodede and Aninge, 1978; Trakulchang and Balloun, 1975; Ekpenyong and Biobaku, 1986).

The objective of this study was to evaluate the effect of feeding activated sewage sludge on broilers.

MATERIALS AND METHODS

The activated sewage sludge used in this trial was collected from the Sewage System plant at the University College Hospital, Ibadan, Nigeria. The activated sewage sludge was sun-dried for one week and milled to a very fine size and sieved through nylon cloth. Three starter rations that contained 0%(control), 10% and 15% dried activated sewage sludge were formulated (Table 1). The diets were calculated to contain approximately 26% crude protein. Another 3 finisher rations were formulated. The diets contained approximately 24% crude protein.

One hundred and eighty day-old broiler chicks were obtained from Alanco Agricultural

TABLE 1: PERCENTAGE COMPOSITION OF EXPERIMENTAL STARTER AND FINISHER DIETS.

Components	Starter Diets			Finisher Diets		
	0% ASD*	10% ASD*	15% ASD	0% ASD*	10% ASD*	15% ASD
Yellow maize	36.04	29.70	26.45	42.02	32.24	28.64
Soybean meal	23.78	20.12	18.37	19.00	18.78	17.88
Blood meal	4.68	4.68	4.68	3.48	3.48	3.48
Fish meal	1.00	1.00	1.00	1.00	1.00	1.00
Brewer's grain	30.00	30.00	30.00	30.00	30.00	30.00
Activated Sewage Sludge (A.S.D.)	-	10.00	15.00	-	10.00	10.00
Oyster shell	2.00	2.00*	2.00	2.00	2.00	2.00
Bone meal	1.00	1.00	1.00	1.00	1.00	1.00
Lysine	0.50	0.50	0.50	0.50	0.50	0.50
Methionine	0.50	0.50	0.50	0.50	0.50	0.50
Commercial						
*Vit/Mineral Premix	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Calculated Analysis						
Energy M.E. kJ/g	19.46	10.41	10.38	10.44	10.44	10.40
Crude Protein (%)	26.45	26.89	27.13	24.13	24.55	25.65

*ASD - Activated Sewage Sludge diet.

*Vitamin mix contained (g/kg diet): Thiamine (0.02), riboflavin (0.03), Pyridoxine (0.10), Vitamin B12 (0.00003) Niacin (0.10), Calcium pantothenate (0.10), P-aminobenzoic acid (6.10), Vitamin A acetate (0.040), ergo calciferol (0.04) and choline Hcl (2.00)

*Mineral Mix contained (g/kg diet): CaCO_3 (15.258), $\text{CoCl}_2 \cdot \text{H}_2\text{O}$ (0.001), $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (0.019), $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ (1.078), MgSO_4 (2.292).

Enterprises Limited in Abeokuta. The average weight of the chicks was 58 g and they were randomly distributed into three groups of sixty animals. The sixty animals in each of the groups were further sub-divided into two sub-groups, such that duplicate groups of thirty animals each were obtained for each sub-group. The animals were provided the rations and water ad libitum. The feeding trial was done for eight weeks.

Records of weekly body weight gain, feed intake were kept while feed efficiency and protein efficiency ratio were determined at 8 weeks.

Analytical techniques

Activated sewage sludge and diets were analysed for their proximate constituents using the methods of the AOAC (1990).

Statistical analysis

Data generated were subjected to one way analysis of variance by method of Snedecor and Cochran (1967). Significant differences between means were determined using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

The activated sewage sludge used in this

experiment contained 24.24% crude protein and 3.50% crude fibre, suggesting that it can be suitable for broiler feeding (Table 2).

The chemical composition of the trial diets showed that the three diets (starter) were similar in terms of dry matter and crude protein. It also showed that the three diets (finishers) were also similar in terms of dry matter and crude protein (Table 2).

The effect of the experimental diets on growth and feed efficiency is shown in Table 3. Average daily gain increased with increase in percentage sewage sludge in the diet and the differences between groups were highly significant, with the highest level of gain achieved at 10% sewage sludge inclusion; and this agrees with the findings of Ekpenyong and Biobaku (1986) that 10% dried activated sewage sludge improved growth response of rabbits, which could be attributed to some growth factors, for example vitamin B₁₂. Moreover the higher level of growth with a high protein level was in agreement with the findings of Omole (1982).

ACTIVATED SEWAGE SLUDGE FOR BROILERS

TABLE 2: CHEMICAL COMPOSITION OF ACTIVATED SEWAGE SLUDGE AND EXPERIMENTAL DIETS (EXPRESSED ON OVEN DRY-BASIS)

Chemical Composition (%)	Activated Sewage Sludge	Starter diets			Finisher diets		
		0% ASD*	10% ASD*	15% ASD*	0% ASD*	10% ASD*	15% ASD*
Crude Protein	24.24	26.70	26.60	25.50	24.46	24.86	24.32
Ether Extract	3.00	2.30	2.00	1.85	2.64	2.34	2.10
Moisture	5.10	3.71	3.68	3.75	3.46	3.32	2.68
Ash	41.80	16.00	23.30	25.50	18.24	24.24	26.40
Nitrogen-free Extract	22.36	42.89	25.22	33.40	43.42	36.56	34.54

A.O.A.C. (1990)

A.S.D. Activated Sewage Sludge

TABLE 3: GROWTH RESPONSE OF BROILERS FED DIFFERENT DIETS

Performance Parameters	Activated Sewage Sludge diets (ASD) (Starter and finisher)			
	0%	10%	15%	SEM ¹
Number of Broilers	60	60	60	
Initial Body Weight (g)	58.00 ^a	58.00 ^a	58.00 ^a	3.68
Final Body Weight (g)	1342.25 ^b	1907.94 ^a	1089.66 ^c	18.94
Daily Wt. Gain (g/day)	22.93 ^b	33.03 ^a	18.42 ^c	4.42
Daily feed intake (g/day)	95.42 ^c	132.42 ^b	140.32 ^a	6.42
Feed/Gain	4.16 ^b	4.00 ^a	7.62 ^c	1.42
Feed efficiency	0.24 ^b	0.25 ^a	0.13 ^c	0.72
Protein efficiency ratio (PER)	8.42 ^b	11.38 ^a	7.24 ^c	1.46
Mortality (0%)	3.33	6.66	16.66	

¹SEM: Standard Error of Mean: Values are the means of Sixteen analysis

²Means along the same row with different superscripts are significantly different ($P < 0.05$)

The significantly ($P < 0.05$) higher growth rate observed in the rabbits fed 10% dried sewage sludge was expected and is in agreement with the findings of Buchers, et al (1983).

Table 3 also shows that the birds that consumed the 15% activated sewage sludge diet had the least body weight gain despite the fact that these birds consumed more feed than those birds on the 0% and 10% diets. This may be due to level of urea in the dried activated sewage sludge as the percentage increased beyond 10% level, because it is known that young animals have little ability to digest effectively diet containing high level of urea, and this is similar to the findings of Tradkuchang (1975) which showed that young rabbits and chicks receiving diet containing 20% dried poultry droppings showed depressed feed efficiency and growth rate. The present results showing a gradual decrease in body weight gain and increase in feed intake as percentage sewage sludge inclusion increased

above 10% may be due to increase in the level of urea.

The feed efficiency of broilers fed 10% activated sewage sludge diet is significantly ($P < 0.05$) different from those broilers fed the 0% and 15% activated sewage sludge diets respectively. The protein efficiency ratio of broilers fed with 10% dried activated sewage sludge was significantly ($P < 0.05$) higher than those of broilers fed with the control (0%) and 15% sewage sludge diets respectively.

This study has shown that University College Hospital, Ibadan dried activated sewage sludge, could be used as feed supplement in the diet of broilers at up to 10% inclusion, with no apparent adverse effects.

REFERENCES

- A.O.A.C. (1990). Association of Official Analytical Chemists. Official Methods of Analysis. 15th ed. Washington D.C.

- BUTCHER, C., BRYANDT, T., OWEN, M.J., LECICH, E., MACHINOD, H. (1983). The effect of slughters weight upon the growth and carcass characteristics of rabbits fed diets of different dietart metabolisable energy concentrations. *Tropical Animal Product* 6: 93 - 100.
- CHEEKE, P.R., GASPER, E., BOERSMA, I. and OLDFIELD, J.E. (1977). Nutritional evaluation with rats of algae (*Chlorella*) grown on swine manure. *Nutr. Reports Intern.* 16: 579 - 585.
- DUNCAN, D.B. (1955). Multiple range and Multiple F. Test *Biometrics* 11: 1 - 42.
- EKPEYONG, T.E. and BIOBAKU, W.O. (1986). Growth response of rabbits fed activated sewage sludge and dried poultry wastes. *J. Applied Rabbit Res.* 9(1): 14 - 19.
- FAO (1982). *Production Year Book*, 1982 Vol. 36 FAO, Rome.
- FIRTH, J.A. and JOHNSON, C. (1955). Sewage sludge as a feed ingredient for swine and poultry. *Agric. and Food Chem* 93: 795.
- MULLER, Z.O. (1980). Feed from animal waste: State of knowledge. FAO Animal Production and Health. Paper No. 18. Food and Agricultural Organisation of the United Nations (FAO), Rome, Italy.
- OGUNMODEDE, B.K. and ANINGE, H.J. (1975). Utilization of dried poultry manure by growing chickens fed on a practical diets. *Brit. Poultry Sci.* 19(2): 137 - 141.
- OMOLE, T.A. (1982). The effect of level of dietary protein on growth and reproductive performance of rabbits. *J. of Appl. Rabbit Res.* 5(3): 83 - 85.
- SCOTT, H.M. and ADAMS, E.G. (1975). The effect of feeding graded levels of activated sludge and Vitamin D on growth and bone ash of chicks. *Poultry Sci.* 34: 1233.
- SHAH, S.I. and MULLER, Z.O. (1982). Feeding Animal Wastes to Ruminants. In: "By-product Utilization for Animal Production". Proceedings of a Workshop on Applied Research held in Nairobi, Kenya, 26 - 30 September, 1982.
- SNEDCOR, G.R. and COCHRAN, W.L. (1967). *Statistical Method*. The Iowa State University Press.
- TRAKULCHANG, N. (1975). Use of dried poultry waste in diets of rabbits and poultry. *Poultry Science* 54: 609 - 611.
- TRAKULCHANG, N. and BALLOUN, S.L. (1975). Effect of recycling dried poultry waste on young chicks and rabbits. *Poultry Sci.* 54: 615 - 618.