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Cheaper Alternative Feedstuffs for Sustainable Cockerel Production: An Admixture of Rural-Urban Resources and Preferences

Samuel O. Aro, Esther Aboyewa, V. Ayobore Aletor
The Federal University of Technology, Dept. of Animal Production and Health, Nigeria
E-mail: sambolaro@yahoo.co.uk

Introduction

Integration of livestock and crop residue allow resources to be recycled more effectively in livestock production enterprise. Large quantities of crop residues generated from private and government farms in Nigeria are wasted every year. Some are left to rot in the field while most are burnt off to create space for further accumulation of wastes. Research efforts into the utilization of these wastes have revealed a lot of potentials that could be tapped if they are incorporated into livestock diets (Aro et al., 2012). Also, a form of social equilibrium within the rural and urban settings is achievable by this livestock-crop residue integration. This has been conceptualised as a three way cyclic process: the rural farmers produce the crops; the agro-allied industries process these crops and generate wastes as a result while the livestock sector coverts these wastes by way of value addition to livestock feed ingredients (Aro, 2010). A win-win situation could therefore be guaranteed for these three major stake holders: the livestock farmer would benefit from cheaper and available ingredients all the year round; the agro-industrial sector would be rid of the inevitable discharge wastes into the environment with the attendant unwholesome implications on the host communities and the fragile environment. The crop producers would also benefit from a ready market outlet for their products and a cheaper retail price for the animal products from the livestock farmers within this continuum. In this paper, the realization of this concept within a rural-urban setting in Nigeria was investigated by integrating cockerel production with wastes generated from cassava cultivation.

Material and Methods

The experiment was carried out at the poultry unit of the Teaching and Research Farm (Livestock Section) of the Federal University of Technology, Akure, Ondo State, Nigeria. Two-hundred and ten day old cockerel birds were purchased from a reputable source and randomly assigned to the seven different experimental treatments (Tables 1 and 2) for a sixteen week feeding trial. Each treatment was replicated thrice with ten birds per treatment. Cassava peels which were incorporated into the diets of the animals were obtained fresh from a cassava processing community located along Igbatoro road (gari producing community), Akure, Ondo state while the cassava starch residues were obtained fresh from Matna Foods Limited; a cassava starch processing factory located at Ogbese, along Owo-Benin express road in Ondo state, Nigeria.

These cassava tuber wastes (CTWs) were sundried for three or more days and crushed to aid further processing. The crushed CTWs were packed and stored in a cool place prior to inoculation with candidate microorganisms for the purpose of value addition to the final products through microbial fermentation. The microbially fermented cassava peels and cassava starch residues were processed by the methods described by Aro (2010).

Results and Discussion

Table 1 shows the growth performance parameters of cockerels fed dietary inclusion of microbially fermented cassava tuber wastes (CTWs). The highest total weight gain (1598.82±32.45g) was recorded for birds fed the control diet, but this value was not significantly different (P>0.05) from the value recorded for birds fed diet T2, T5 and T6. The result showed that MFCP and MFCSR could be used for cockerels up to 20% and 40% levels respectively. The feed conversion ratio values ranged between 4.42 in diet T1 and 8.74 in diet T4. The control diet (T1) had statistically similar FCR value with T2 and T6, a further confirmation that these two CTW diets could be used for cockerel production without any adverse effects on growth performance. The lowest final weight was recorded in T4 and T7 with 60% inclusion of CTWs. This means that 60% inclusion level of MFCP or MFCSR would be detrimental to the growth of cockerel birds if the final weight is to be considered (Aro, 2010).

Table 1: Performance of cockerels fed graded level of microbially fermented cassava tuber waste-based diets

Parameters	T1	T2	T3	T4	T5	T6	T7
Initial weight/bird(g)	36.48±0.21	37.50±0.80	37.50±0.80	37.50±0.80	38.89±0.10	38.89±0.21	38.89±0.40
Final weight/bird(g)	$1635.30±32.45^{a}$	$1582.90±58.13^{a}$	$1214.40±53.05^{c}$	$996.82±70.50^{d}$	$1470.00±72.34^{ab}$	$1337.60±18.79^{ab}$	$1192.90±106.02^{c}$
Total feed intake/bird(g)	7059.50±2.32	7231.30±1.16	7903.80±7.35	8385.30±1.39	8331.10±1.39	7502.70±1.37	8406.30±8.75
Avg.wkly. feed intake /bird(g)	441.84±29.09	451.96±14.49	493.99±91.21	524.08±17.44	520.69±37.41	468.92±17.17	525.39±109.36
Total wt.gain/bird(g)	$1598.82±22.15^{a}$	$1545.40±48.11^{a}$	$1176.90±51.33^{bc}$	$959.32±73.55^{c}$	$1431.11±70.38^{a}$	$1298.71±18.66^{ab}$	$1154.01±99.12^{bc}$
Avg.wkly wt. gain/bird(g)	$101.05±1.26^{a}$	$93.59±7.95^{a}$	$73.56±8.84^{bc}$	$59.96±5.71^{c}$	$89.44±8.15^{a}$	$81.17±2.47^{ab}$	$72.13±11.30^{bc}$
Mortality (%)	$3.33±1.92^{c}$	$4.44±1.11^{c}$	$5.56±1.11^{c}$	$10.00±1.92^{bc}$	$14.4±1.11^{ab}$	$6.67±1.92^{c}$	$18.89±4.84^{a}$
FCR	$4.42±0.25^{a}$	$4.68±0.30^{ab}$	$6.72±0.31^{cd}$	$8.74±0.87^{e}$	$5.82±0.32^{bc}$	$5.78±0.31^{ab}$	$7.28±0.16^{ed}$

a,b,c,d,e = Means with different superscripts within the same rows and for the same parameters are statistically (P< 0.05) significant.
Mean ± Standard Error of mean; Avg.wt = Average weight; FCR = Feed conversion ratio
T1 = Control treatment; T2 = Treatment with 20% MFCP; T3 = Treatment with 40% MFCP; T4 = Treatment with 60% MFCP; T5 = Treatment with 20% MFCSR;
T6 =Treatment with 40% MFCSR; T7 = Treatment with 60% MFCSR; MFCP = Microbially Fermented Cassava Peel;

MFCSR= Microbially Fermented Cassava Starch Residue.

Table 2 shows the economy of production of birds fed graded levels of microbially fermented of cassava tuber wastes. The cost of feed consumed by the birds were significantly different (P<0.05) among the treatments. The highest cost of feed consumed was observed in T7 ($4.44) and the lowest cost of feed consumed was recorded in T4 ($2.81). The cost of feed per kilogramme body weight gain was best in T2 ($1.90) while it was poorest in T7 ($3.85). The economic effect of this is that MFCP could be used profitably at 20% inclusion and MFCSR up to 40% level without compromising the economic benefits of cockerel birds (Aro *et al*., 2012). The comparable cost- benefit ratios of 0.12:1 (T1), 0.12:1 (T2) and 0.15:1 (T6) also gave support to the profitable use of these fermented wastes (MFCP and MFCSR) at 20% and 40% inclusion levels respectively.

Table 2: Economy of production of cockerels fed graded levels of microbially fermented cassava tuber waste- based diets

Parameters	T1	T2	T3	T4	T5	T6	T7	±SEM
Initial weight/bird(g)	36.48	37.50	37.50	37.50	38.89	38.89	38.89	0.21
Final weight./bird(g)	1635.30^{a}	1582.90^{a}	1214.40^{c}	996.82^{d}	1470.00^{ab}	1337.60^{bc}	1192.90^{c}	58.75
Total wt.gain/bird(g)	1598.82^{a}	1545.40^{a}	1176.90^{bc}	959.32^{c}	1431.11^{a}	1298.71^{ab}	1154.01^{bc}	54.50
Total feed intake/bird(g)	7059.50	7231.30	7903.80	8385.30	8331.10	7502.70	8406.30	33.39
Cost of feed/kg($)	0.44	0.41	0.37	0.34	0.42	0.40	0.53	0.00
Cost of feed consumed/bird ($)	3.11^{c}	2.93^{d}	2.93^{d}	2.81^{e}	3.51^{b}	2.99^{d}	4.44^{a}	0.15
Cost of feed/body wt. gain ($)	1.95^{d}	1.90^{d}	2.49^{c}	2.93^{b}	2.45^{c}	2.30^{cd}	3.85^{a}	0.14
Cost of medication($)	6.58	6.58	6.58	6.58	6.58	6.58	6.58	0.00
Sundry expenses($)	9.93	9.93	9.93	9.93	9.93	9.93	9.93	0.00
Price of bird/kg ($)	3.68	3.68	3.68	3.68	3.68	3.68	3.68	0.00
Sales of birds ($)	162.52^{a}	151.49^{a}	111.75^{bc}	77.52^{cd}	91.99^{c}	118.17^{ab}	56.94^{d}	19.34
Cost-benefit ratio	0.12:1^{e}	0.12:1^{e}	0.17:1^{d}	0.24:1^{b}	0.21:1^{c}	0.15:1de	0.36:1^{a}	0.04

a, b,c,d,e = means with different superscripts within the same rows and for the same parameters are significantly different (P < 0.05)
T1 = Control treatment; T2 = Treatment with 20% MFCP; T3 = Treatment with 40% MFCP; T4 = Treatment with 60% MFCP; T5 = Treatment with 20% MFCSR;
T6 =Treatment with 40% MFCSR; T7 = Treatment with 60% MFCSR; MFCP = Microbially Fermented Cassava Peel;
MFCSR= Microbially Fermented Cassava Starch Residue; 1US$ = ₦ 163 as at 08/09/2013
SEM = Standard error of the mean

Conclusions and Outlook

Feed intake increased with dietary increase in the levels of the CTWs while weight gain was depressed above 20MFCP and 40% MFCSR respectively, hence the use of these wastes would not depress feed intake in cockerel birds but their utilization beyond 20% for MFCP and 40% for MFCSR could depress feed utilization. The cost of feed consumed per bird was relatively lower to the control diet up 60% MFCP and 40% MFCSR while the cost-benefit ratios at 20% MFCP and 40% MFCSR compared with the control. Therefore within the limit of this experiment, these fermented cassava tuber wastes could be used to raise cockerel birds to market weight at a relatively cheap cost when MFCP and MFCSR are incorporated at 20% and 40% levels respectively.

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References

ARO, S. O., AGBEDE, J. O., DAIRO, O. O., OGUNSHOTE, E. AND ALETOR, V. A. (2012). Evaluation of fermented cassava tuber wastes in broiler chickens feeding. Archiva Zootechnica 15: 3, 49-60

ARO, S. O. (2010). Growth and reproductive response of swine fed fermented cassava tuber wastes. (PhD Thesis). University of Ibadan, 2010. pp. 176.