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Effect of Cow Dung Based Biogas Energy on the Performance of Starter Broiler Chicks

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ABSTRACT

An experiment was conducted at the Poultry Unit of Imo State University Teaching and Research Farm to evaluate the effect of different sources of farm energy (Heat) on the performance of starter broiler chicks. The 28-day experiment involved ninety day old Anak broiler chicks shared into three treatments (T_1, T_2, T_3) and assigned to Biogas energy (BE), charcoal energy (CE) and kerosene energy (KE) respectively. The experiment was replicated three times in a completely randomized design. Commercial broiler starter feed and potable water were supplied to the birds ad libitum, while standard management practices such as cleanliness of the pens, routine vaccination and medication were adopted. Performance parameters measured initial weight, final weight, and feed intake from which weight gain, feed conversion ratio and cost benefit analysis were calculated. Results show significant difference ($P<0.05$) between the final liveweight of birds raised on biogas energy 638.38g, the birds on charcoal energy 631.67g and those on kerosene energy 568.33g, showing superiority of T1 over other treatments. The cost benefit analysis also show that biogas is cost effective and significantly cheaper ($P<0.05$) than kerosene sources of farm energy.
Keywords: *Cow dung, Biogas, Heat energy, Broiler Chicken, Performance*

INTRODUCTION

Production of readily available, cost effective, sustainable and environment friendly source of farm energy is imperative especially now the stakeholders in environmental protection and animal production emphasize environment friendly technologies and affordable animal products in developing countries. Regular sources of farm energy notably – oil, petrol and kerosene, coal etc is not only found to be costly but also emit poisonous gases which cause air pollution. This high cost of farm energy increases the cost of poultry production thus making the product unaffordable by the common man.

Thus, as a panacea to the high cost of livestock products arising from high energy cost, it is imperative that cheaper and environment friendly sources of energy be developed. The processing of livestock by-product seems to have the potentials to resolve this production cost crises. Recently, livestock dung nobly the cow dung, which hitherto was littered indiscriminately, causing environmental pollution is found as a potential source of renewable energy for farm and domestic use.

The cow dung has the capacity to produce high amount of combustible biogas. Ciborowski (2001) had defined biogas as inflammable gas produced from anaerobic fermentation of organic materials inside a digester and used in heating or lighting a house. Also Martin and Zoehr (1980) had stated that biogas can be used as a combustible in kitchen and motors. This is however, achievable if there is effective separation of methane from other gases notably CO_2, NH_3 and H_2S to achieve effective burning (BRTC, 1994).

In this trial, cow dung was used to produce biogas, which was used as a source of heat in broiler chick brooding. The objective of this trial is therefore to ascertain the economic effectiveness of using biogas as energy source in broiler brooding as against the conventional energy sources – kerosene and coal.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at the Poultry Unit of Imo State University Teaching and Research Farm, Owerri, Nigeria and is located at longitude 7^{o}01'06 and 7^{o}03' 00'E and latitude 5^{o}28' 24^{o}N and 5^{o}30' 00'N.

CONSTRUCTION OF DIGESTER

The biogas digester, a metal chamber was constructed for the purpose of fermenting organic materials for biogas production. It has two valves – one inlet and one outlet valve and has opening on top which is sealed to avoid air and water leakage (Songhai Training Manual, 2001). The digester, cylindrical in shape has a capacity of 90 litres, and height of 1.2m.

COW DUNG COLLECTION AND FERMENTATION

Cow dung was collected from Owerri cattle market and put into the digester. The ratio of cow dung to water was 1:2m which was vigorously stirred to farm slurry which constituted 60% of volume of the digester while the remaining 40% was left for gas accumulation. The anaerobic digestion completes within 8 days. Every fortnightly was partly removed and some quantity of fresh dung and water used to replace it to ensure regular production of the gas while stirring not only releases gas from the slurry but also prevents the formation of hard scum at the surface. The digester was kept under the sun to ensure adequate temperature for fermentation and gas production. Internal temperature of the digester was daily checked and recorded daily at 7.00 hours – 17.00 hours and the range was 33 – 35^{o}c. Black point in the body of the digester helped to conserve heat during the night.

GAS COLLECTION AND UTILIZATION

The gas in the anaerobic digester was collected into the head space above the slurry from where it passed through the filtration chamber via some pipe work.

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The filtering chamber contained a mixture of calcium carbonate to filter CO_2, iron filling for H_2S and coal for NH_3, in accordance with (BRTC, 1994). With these chemical reactions, methane (CH_4) becomes preponderant and release of the gas using a rubber pipe from the filtration to the burner ensured complete combustion with blue flame. The gas burner was passed under a hover to intensify the heating of the broader house for proper chick development gas using a rubber pipe from the filtration to the burner ensures complete combustion with blue flame. The gas burner used was passed under a hover to be able to intensify the heating of the brooder house. Kerosene was burnt in medium size stove and coal in metal burner. Both were put under hovers.

PROCUREMENT AND BROODING OF EXPERIMENTAL BIRDS

Ninety day old Anak broiler chicks were purchased from local dealer in Owerri, shared them into three groups of 30 birds per treatment in which T_1 had its heat source from biogas, T_2 from coal and T_3 from kerosene, which was further replicated three times in a completely randomized design. All standard chicks brooding practices were applied while the birds were fed broiler starter feed and potable water *ad libitum.*

Initial weight and final weights of the birds were weighed while weight gain was calculated by subtracting the initial weight from final weight, feed intake by subtracting feed left over from feed supplied, while feed conversion ratio was measured as weight gain divided by feed intake. Cost benefit analysis was also calculated to evaluate the cost implications of using various sources of heat in brooding chicks. Data were subjected to one way analysis of variance (Steel and Torrie, 1980) while differences in means were separated using the Duncan's Multiple Range Test as outlined by (Onuh and Igwemma, 1998.)

RESULTS AND DISCUSSION

The results of the performance of starter broilers, subjected to various sources of heat are presented below (Table 1). The initial weights were similar ($P>0.05$). However, significant differences ($P<0.05$) were observed between the treatments for final live weight, weight gain, feed intake, feed conversion ratio and Cost Benefit Analysis.

The final weights 638.33g, 631.67g and 568.33g for T_1 (Biogas), T_2 (charcoal) and T_3 (kerosene) heat respectively were significantly different ($P<0.05$) showing superiority of bigas over other sources of heat. This is likely to be caused by minimal emission of poisonous gases, thereby boosting efficient circulation of blood which provided friendly environment for weight gain of the chicks. Feed intake significantly ($P<0.05$) differed with birds on charcoal consuming the highest amount. This might be because of fluctuations of heat often observed in this source, which agrees with Madubuike and Ekenyem (2001), that lower temperature on livestock increases feed intake in order to generate enough energy for temperature stabilization, implying that when temperature lowers, during heat fluctuation in charcoal source, feed intake increases, unlike other sources that are more stable.

Table 1: Performance of Starter Broilers raised with different sources of heat

Parameters	T_1 Biogas	T_2 Chacoal	T_3 Kerosene	SEM
Initial weight (g)	40.33^a	40.33^a	40.17^a	0.08
Final weight (g)	638.33^a	631.67^b	568.33^c	8.33
Weight gain (g)	598.00^a	591.33^b	528.70^c	8.14
Feed intake (g)	241.33^b	254.33^a	240.33^c	0.001
Cost Benefit Analysis (₦)	888.67^b	891.00^b	2826.67^a	15.56

a,b,c,: means with different superscripts are significantly different (P<0.05).

The cost benefit analysis showed that biogas and charcoal were significantly (P<0.05) cheaper than kerosene as sources of heat in broiler production. This observation satisfies the main objective of this trial, which is to achieve lower cost of broiler chick production thereby making the product affordable for the people.

CONCLUSION/RECOMMENDATION

Farm energy is a source of cost in broiler chicks production. Kerosene has long supplied heat energy for brooding birds but its cost greatly increases the cost of poultry production. Biogas, which is generated from organic waste (cow dung) significantly (P<0.05) reduced the cost of broiler chick production. Consequently, due to reduced cost and environment friendliness of biogas as source of heat in broiler chick brooding, it is recommended that intensive work be done on biogas production and use in other areas of livestock production.

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