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# Growth performance characteristics and economy of production of crossbred growing pigs fed sundried soybean milk residue

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***Target Audience:*** *Animal nutritionists, Livestock researchers, Pig farmers, Extension workers, Feed millers*

## Abstract

*Eighteen (18) growing pigs (Largewhite X Landrace) were used to investigate the nutritional value of sundried soybean milk residue (SSMR) as substitute for soyabean meal on growth performance characteristics and economy of production of the experimental animals. Three experimental diets were formulated by incorporating SSMR into basal diet to replace soyabean meal at 0, 5 and 10% designated as T1 (control), T2 and T5 respectively. The experimental pigs were individually weighed and allotted into three dietary treatments of three replicates of six animals each in a completely randomized design. The animals were fed for one week pre-experimental period and thereafter for eight weeks during which data were collected. The pigs were weighed weekly to determine weight gain and feed conversion ratio while linear body measurement parameters were measured using tape rule. The results revealed that the dietary treatments did not influenced ($p>0.05$) the growing pigs performance. Feed cost per kilogram live weight gain (27.50) of the animals fed 0% SSMR significantly ($p<0.05$) reduced to 26.61 (5%SSMR) and 25.65 (10% SSMR). It was concluded that feeding growing pigs with sundried soybean milk residue has no detrimental effect on the performance of pigs and led to the reductions in the cost/kg and cost of feed per kilogram live-weight gain with increasing levels of SSMR in the diets. It is hereby recommended that sundried soybean milk residue should be incorporated in the diet of growing pigs without any adverse effect on the growth performance of the pigs.*

***Keywords:*** *Economy of production, growing pigs, linear measurement, performance, sundried soybean milk residue*

## Description of Problem

Increased in growth of human and livestock population in Sub-Saharan Africa is creating rapid increase in food demands. Therefore, feed supply has remained a major hindrance in livestock production because of the ever increasing cost of orthodox feedstuffs occasioned by the competition between man and livestock for both cereal grain and legume seeds (1). (2) reported that these increase in population and the pressures on a fixed land base are likely to promote several competitions for resources and drive agriculture progressively towards intensification. As a result of increase in the production levels of food crops, there will be more residues and by-products left after harvest and in the industries. These by-products could be a source of feedstuffs in livestock diets and an example of such is the

sundried soybean milk residue (SSMR). Sundried soybean milk residue is a by-product of milk and cheese produced from soybean (3). (4) opined that sundried soybean milk residue is a good source of protein in feeding livestock. Pig or swine as interchangeably used for this animal is well adapted for the production of meat because they grow and mature rapidly. They have a short gestation period easily described as three months, three weeks and three days (114 days) and they produce large litter size each time they farrow. They are ominivorous in feeding habit and can scavenge for food under poor management. Nigeria as a country lying within the tropical belt is deficient in food production and protein malnutrition is rapidly increasing in most part of the country especially among the urban and rural populations. In view of this, there is the need to intensify efforts to increase food production especially that of animal origin. Pig production readily provides solutions to animal protein deficiencies. Pig production can yield relatively rapid rate of economic return on capital due to the high fecundity and growth rate. Other pig by-products such as skin, bristle, lard, bone, blood and faeces offer great value and source of increased revenue to the piggery farmer. Weight and other linear body measurement are important parameters in animal production. Feeding and medication are based on the body weight of the animal. (5) advocated that growth is measured by increase in body weight. (6) also reported that weight is the pivot on which animal production thrives. Pricing of animals is based on live weight and when animals are priced and bought by visual appraisal as in our traditional practice, invariably, the middlemen gain and farmers lose. It is always pertinent to determine the weight of pigs as such knowledge is essential for a number of reasons which include determination of feed requirements (7), animal health status, determination of growth rates, determination of time when animals are sent to market, space allowances and determination of drug dosage (8). In commercial farms, accuracy of predicting pig weight leads to profitability due to reduction in feed costs which account for 60% of production as feed requirements are accurately calculated (9). Cost are also reduced in the treatment of disease as there is no overestimation of weight and underestimation of weight could be potentially dangerous due to the development of drug resistance. Live weight and change in live weight could also be used in determining responses to genetic selection (predicting live weight of pig)(10).The present trial aimed at determining the effect of feeding sundried soybean milk residue on the performance, linear body measurement and economy of production of crossbred growing pigs.

## Materials and Methods

***Experimental location***: The experiment was carried out at the piggery unit of the Teaching and Research Farm of the Oyo State College of Agriculture and Technology, Igboora, Nigeria which lies within $7^0$ 15 North and $3^0$ 30 East of equator with an average rainfall of 1278mm and average annual temperature of $27^0$C (11)

***Experiment diet:*** The test ingredient (soybean milk residue) in its wet form was collected from women producing soymilk within Igboora metropolis and sundried for three weeks depending on environmental temperature and intensity of sun and afterwards packed in a polythene bags for further laboratory analysis.

***Experimental animals and management:*** Eighteen (18) crossbred (Large White x Landrace) grower pigs were obtained from the piggery unit of the Teaching and

Research Farm of the Oyo State College of Agriculture and Technology, Igboora. The pigs were dewormed using dewormer and fed 4% of their body weight as feed per day at the beginning of the experiment and increased as the pigs were advance in age while water was supplied *ad libitum*. The pigs were allowed three (3) days acclimatization and the animals were fed twice daily in the morning at 7:00am and in the evening at 4:00pm. The experiment lasted eight (8) weeks.

**Data Collection**

***Growth Performance:***

***Measurement of body weight*:** The animals were weighed weekly in the morning before the pigs were served experimental diets. Records of these weekly weights were kept throughout the experimental period. The records were used to determine the performance of pigs using the following measurements:

***Weekly body weight gain:*** This was calculated as differences between a week's weight and the previous week's weight expressed in kilogram (kg). To get the daily weight gain, the weekly weight gain was divided by seven (7)

***Feed conversion ratio*:** This is the ratio of feed consumed to the body weight change and it is expressed as FCR =

$$\frac{\text{Average Feed Intake (kg)}}{\text{Average Weight Gain (kg)}}$$

***Feed intake*:** The 4 – 5% body weight of feed was fed per pig and this was recorded on daily daily basis. The leftover after each days meal was kept separate, measured and recorded for each replicate on a daily basis. Feed intake for each day was obtained from the differences between the feed given per day and the leftover.

***Linear Body Measurements***

*Shoulder height*: This measurement was carried out to determine the length of the shoulder height throughout the experiment period by placing tape rule (cm) on the shoulder and measured towards foot.

*Body length*: This is the measurement from the neck to the tail using tape rule (cm)

*Shoulder width*: This measurement was done to know the length of the shoulder width and was recorded by placing tape rule (cm) on back side of the shoulder.

*Chest*: This measurement was taken throughout the experiment and the length was taken by placing tape rule (cm) on the elbow towards the fore rib area to other side of elbow.

*Flank*: This measurement was taken from the rear flank to the rump and back to the other rear flank using tape rule (cm)

***Economy of Production***

Cost of 100kg of feed (#) = 100kg x Cost of feed (#/kg)

Unit cost per kg of feed (#/kg) = Cost of 100kg of feed (#) / 100

Cost of weight gain (# / kg) = Cost of feed (# / kg) x weight gain

Cost of feed / pig (#/kg) = Cost of feed (# / kg) x feed intake

**Statistical Analysis**

All data collected were subjected to one-way analysis of variance (ANOVA) using SAS (12) and Duncan's Multiple Range Test option of same software was used to separate means.

**Table 1: Gross composition of experimental diets**

| Ingredients | T1 (0%) | T2 (5%) | T3 (10%) |
|---|---|---|---|
| Maize | 46.30 | 44.62 | 42.94 |
| Corn bran | 15.00 | 15.00 | 15.00 |
| Soybean Meal | 10.00 | 9.00 | 8.00 |
| Sundried Soybean Milk Residue | 0.00 | 2,68 | 5.36 |
| Palm Kernel Cake | 23.00 | 23.00 | 23.00 |
| Fish meal | 3.00 | 3.00 | 3.00 |
| Bone meal | 2.00 | 2.00 | 2.00 |
| Salt | 0.50 | 0.50 | 0.50 |
| Grower Premix | 0.20 | 0.20 | 0.20 |
| Total | **100.00** | **100.00** | **100.00** |
| **Determined Analysis** | | | |
| Dry Matter (%) | 91.06 | 90.40 | 91.71 |
| Crude Protein (%) | 18.90 | 19.05 | 19.10 |
| Crude fibre (%) | 5.00 | 6.00 | 7.00 |
| Ash (%) | 5.20 | 5.01 | 5.30 |
| Ether extract (%) | 5.00 | 4.50 | 4.60 |
| Nitrogen Free Extract (%) | 56.96 | 58.14 | 53.71 |
| Digestible Energy (kcal/kg) | 3.326 | 3.601 | 3.507 |

**T1:** 0% inclusion of sundried soybean milk residue
**T2:** 5% inclusion of sundried soybean milk residue
**T3:** 10% inclusion of sundried soybean milk residue

## Results and Discussion

The results of growth performance of crossbred growing pigs fed sundried soybean milk residue are as presented in Table 2. There was no significant ($p>0.05$) difference in all the growth performance parameters measured. Pigs on the control diet compare favorably with pigs maintained on the experimental diets. The final body weight ranges from 26.33kg in T2 to 29.50kg in T3 though not statistically ($p>0.05$) different. The results of final body weight gain recorded in this study was contrary with the findings of (13) who reported improved growth performance of weaner rabbits fed sundried soybean milk residue based diets. The growth rate of animal is dependent on its level of feeding and if the level is high, growth will be rapid and the animal reaches a specified weight at an early stage. Average weight gain was not significantly ($p>0.05$) influenced by the dietary treatments. The average weight gain values recorded in this study was lower than the 18.1g of (14).The numerical but insignificant ($p>0.05$) lower feed intake and weight gain of the animals fed sundried soybean milk residue based diets than the control may point to presence of residual anti-nutrients in sundried soybean milk residue. Pigs fed varying levels of sundried soybean milk residue had lower numerical weight gain than those fed on control diet. Increasing the level of sundried soybean milk residue in the experimental diets depresses the weight gain of the pigs. (15) also reported similar reductions in feed intake and weight gain when birds were fed with diets having anti-nutritional factors. Another probable reason for reduction in feed intake may be the contents of the fiber which increased with increasing inclusion level of the sundried soybean milk residue. This might have caused earlier gut fill in pigs fed sundried soybean milk residue. High

dietary fiber level would have exerted depressive effect on nutrient intake by causing early gut fill (16). (17) also observed that fibrous feed tends to spend longer time in digestive tract thereby resulting in reduced feed and nutrient intake. Pigs showed no significant (P>0.05) difference for feed conversion ratio. The feeds (control and sundried soybean milk residue based diets) were similarly utilized. This could be attributed to the contents of residual anti-nutritional factors in sundried soybean milk residue. Pigs that have low feed conversion ratio are considered efficient users of feed. Nature of feed and age of the animal are some of the factors known to affect feed conversion ratio. Similar values recorded for the performance characteristics (initial body weight, final body weight, weight gain, feed intake and feed conversion ratio) obtained across the dietary treatments may be as a result of adequacy of the nutrients and energy contents in all the experimental diets. Cost per kilogram of the experimental diets and the average cost of feeding each animal decreased as the levels of sundried soybean milk residue in the diets increases. Diet T1 (0% sundried soybean milk residue) had the highest cost while diet T3 (10% sundried soybean milk residue) had the lowest cost. There were 145.97, 140.78 and 135.69% reductions in the cost per kilogram of feed at 0%, 5% and 10% sundried soybean milk residue inclusion levels. The corresponding reductions in the cost of feed per kilogram live weight gain were 27.50, 26.61 and 25.65% in the same order. (18) opined that the major reason for the utilization of alternative feed ingredients in the diet of livestock is to lower the cost of production. As the levels of inclusion of sundried soybean milk residue increased, the feed becomes cheaper. Efficiency of feed utilization and better conversion of feed ingredients to better and quality animal products matter most and not the cost per kilogram of feed.

**Table 2: Performance characteristics and economy of production of growing pigs fed sundried soybean milk residue**

| Parameters | T1 | T2 | T3 | SEM |
|---|---|---|---|---|
| Initial Weight (g/pig) | 25.50 | 24.67 | 25.83 | 1.41 |
| Final Weight (g/pig) | 28.17 | 26.33 | 29.50 | 1.43 |
| Weight Gain (g/pig) | 2.67 | 2.67 | 3.00 | 0.17 |
| Feed Intake (g/pig) | 188.77 | 188.53 | 188.63 | 0.17 |
| Conversion ratio | 0.01 | 0.01 | 0.01 | 0.01 |
| Cost of 100kg of feed (₦/kg) | 14597.00$^{a}$ | 14077.80$^{b}$ | 13568.60$^{c}$ | 242.40 |
| Cost of feed (₦/kg) | 145.97$^{a}$ | 140.78$^{b}$ | 135.69$^{c}$ | 2.42 |
| Cost of weight/feed (₦/kg) | 389.74$^{b}$ | 375.88$^{c}$ | 407.07$^{a}$ | 7.37 |
| Cost of feed / pig (₦/kg) | 27.50$^{a}$ | 26.61$^{b}$ | 25.65$^{c}$ | 0.44 |

**T1**: 0% inclusion level of sundried soybean milk residue
**T2**: 5% inclusion level of sundried soybean milk residue
**T3**: 10% inclusion level of sundried soybean milk residue

Data on the linear body measurement of crossbred growing pigs fed with sundried soybean milk residue are as presented in Table 3.There was no significant (p>0.05) difference in all the parameters measured except the chest. The mean values of

shoulder ranged from (0.67cm) to (1.17cm). For body length, the values ranged from (1.67cm to 2.67cm). Pigs maintained on the control diet recorded the highest mean value (1.67cm) of shoulder width while the lowest value (0.33cm) was obtained in pigs fed T2. The highest value (2.33cm) of flank was recorded in pigs on diet 2 while the least value (1.83) was obtained in pigs on diets 3. Middle back height was highest (5.33cm) in pigs on diet 3 while pigs on the control diet recorded the lowest value (3.17cm). Linear body measurements are useful predictors of body weight. Pigs on treatment 4 recorded significantly ($p<0.05$) higher changes in these linear measurement than pigs on the other treatments. It also agrees with the view of (19) and (20) that changes in linear body measurements are indications of tissue growth and tends to increase as the animal grows. The possible reason for this variation may be due to breed or genotype difference, age of the animals and other environmental factors like climate, temperature and feeds.

**Table 3: Linear body measurement of crossbred growing pigs fed sundried soybean milk residue**

| Parameters (cm) | T1 (0%) | T2 (5%) | T3 (10%) | SEM |
|---|---|---|---|---|
| SH | 0.67 | 1.50 | 1.17 | 0.26 |
| BL | 1.67 | 2.50 | 2.67 | 0.83 |
| SW | 1.67 | 0.33 | 0.83 | 0.36 |
| Chest | $1.07^{ab}$ | $2.50^{a}$ | $0.83^{b}$ | 0.35 |
| Flank | 2.00 | 2.33 | 1.83 | 0.48 |
| MBH | 3.17 | 4.67 | 5.33 | 0.60 |

$^{Ab}$Means along the same row with different superscript are significant ($P<0.05$) different

SH - Shoulder Height (cm)
BL - Body Length (cm)
SW - Shoulder Width (cm)
MBH- Middle Back Height (cm)

## Conclusion and Applications

1. Inclusion of sundried soybean milk residue in the diet of growing pigs did not significantly affected the performance, linear body measurement and economy of production of pigs
2. Sundried soybean milk residue could be incorporated in the ration of growing pigs at 10% level of inclusion without adverse effects on growth performance, linear body measurement and cost of production

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