

BIBLIOGRAPHY

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ABSTRACT

The study was conducted at Brgy. Gaswiling, Kapangan, Benguet from November 2011 to February 2012 to determine the effect of chopped banana trunk and sweet potato leaves and vines as feed supplement on the performance of growing- finishing pigs.

A total of 9 pigs, belonging to one litter and were more or less three months old, were grouped into three treatments following the completely randomized design (CRD). The different rations which composed the treatments were as follows: 100% commercial feeds, 100% commercial feeds + 2 kg chopped banana trunk and 100% commercial feeds + 2kg chopped sweet potato leaves and vines.

The parameters measured were initial and final weights, gain in weight, feed consumption, feed conversion ratio, and returns on investment. Statistical analysis revealed that the performance of pigs fed with commercial feeds plus chopped banana trunk or sweet potato leaves and vines was comparable to those pigs fed with commercial feeds only. This was proven by the non- significant differences in terms of body weights, total and average daily gain in weight.

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Though the ROI was not subjected to statistical analysis, results of the study revealed that the pigs fed with commercial feeds alone had a higher ROI of 32.02% compared to the pigs fed with commercial feeds plus chopped banana trunk and sweet potato leaves and vines with ROIs of 21.62% and 26.29%, respectively.



INTRODUCTION

Swine raising is one of the most profitable and well-developed sectors of animal industry in our country. Swine are raised as a source of food and additional income especially for backyard raisers. It is a fast growing home-based enterprise which has the potential for high profits in relatively short period of time. No other backyard animal raised has the same versatility as the swine. Every part of the animal is an important source of essential and useful-product aside from being the source of high quality red meat.

At present, one of the problems on swine production revolves around shortage and high cost of feedstuffs that supply the proper amount of nutrients needed by the animal. Because of the above, swine raisers, most especially the backyard raisers, are adding non-conventional feedstuffs into the feed of their pigs. Examples of these non-conventional feedstuffs are banana trunks and sweet potato leaves and vines and this is what the researcher is going to find out in the study. i.e. the effect of the above non-conventional feedstuffs on the performance of growing-finishing pigs.

Banana and sweet potato are abundantly grown in the Cordillera Region. Generally, from the sweet potato, what is used by man for food is the sweet potato roots and sweet potato tops. So, the remaining sweet potato vines and leaves are considered wastes. On the other hand, the banana trunks are actually left when their fruits are harvested and so these are wasted. Most of the swine raisers, particularly those under backyard scale, feed their pigs with the above so called waste materials and this is mainly to reduce feed cost.

The result of this study can serve as a guide not only to the swine raisers but also to other students or researchers to come up with follow-up researches. It will also help the



banana and sweet potato growers because the parts of their crops that are usually wasted will be valued.

Generally, this study was conducted to determine the effect of chopped banana trunk and sweet potato leaves and vines as feed supplements on the performance of growing-finishing pigs.

Specifically, it aimed to : (1) determine the gain in weight, (2) feed conversion ratio, (3) feed consumption, and (4) the profitability of raising pigs when fed with commercial feeds supplemented with chopped banana trunk or sweet potato leaves and vines.

This study was conducted at Gaswiling, Kapangan, Benguet from November 2011 to February for a period of 90 days.



REVIEW OF LITERATURE

From the different studies conducted on vegetable refuse as feed supplement, it was noted that animals fed with these feedstuffs showed significant effects on their growth performance, and feed consumption. Vegetable wastes are essential as feed supplements for vegetable contains most food nutrients (Bautista and Mabesa, 1997).

Baker (1990) said that the interaction of crops and animals plays a key role in achieving ecological sustain ability by intensifying nutrient energy cycles. Residues of crops are important sources of animal feeds in a small scale farming systems. Therefore and because banana trunk is rejected and it is left as non-economical, this would be a good source of animal feeds.

The banana contains a fair amount of carbohydrates; it is rich in fiber, vitamin c and potassium. Be emphasized that it contains no fat cholesterol that are known to be harmful to our body. Other vitamins found in bananas are vitamin A, B1, B2, In Very important is the presence of potassium, which provides several benefits for example, it is essential for the functioning of the cardiovascular system. addition to potassium contains calcium, phosphorus and iron.

Sweet potato is one of the world's most important food crops. Its main nutritional importance has been its starch content. However, it is also a source of other nutritional important dietary factors, such as vitamin A, ascorbic acid, thiamin, riboflavin and niacin. Low protein, fat and fiber levels are found in the roots, but the high nitrogen-free-extract fraction in this tuber is indicative of their main potential value as an energy source, Vines have a lower carbohydrate content but are higher in fiber and protein and so their principal nutritive value is as a source of vitamins and protein. The nutritional composition of sweet



potato vines and leaves are the following: Dry matter, 14.2; N x 6.25, 18.5; ash, 12.5; ADF, 25.5; and gross energy (MJ/kg), 14.4 (Gody and Elliot, 1981).

A number of sweet potato varieties were evaluated with respect to the biomass yield of the leaves, stems and tubers under different leaf harvesting intervals and defoliation techniques with the aim of selecting the best varieties for forage production. The biomass yields of leaves, stems and tubers were found to vary according to variety, season and defoliation technique. The best options in terms of leaf and stem production were a cutting interval of 20 days and a defoliation of 50% of the total branches. Defoliation reduced tuber production. Sweet potato leaves (SPL) had a crude protein (CP) content of 25.5-29.8% in dry matter, which was markedly higher than in the stems. The leaves can be preserved as feed for pigs by ensiling with cassava root meal, sweet potato root meal or sugarcane molasses as additives. The optimum level of additive is 60g/kg of the wilted sweet potato leaves. The digestibility in growing pigs of dry matter, organic matter (OM) and CP of ensiled sweet potato leaves was high, but that of crude fiber was low. Sweet potato leaves can be used for feeding pigs in fresh, dry and ensiled forms. The total tract and ideal digestibility values of CP, OM and neutral detergent fiber (NDF), and ideal digestibility of amino acids were not different among fresh, dry and ensiled sweet potato leaves. The mean ideal and total tract digestibility of the CP of sweet potato leaves was 74% and 76%, respectively. Sweet potato leaves are high in protein content compared to other protein-rich forages. Lysine is the first limiting amino acid. Growing pigs fed sweet potato leaves with addition of synthetic lysine had daily live-weight gains of 536g/day, which was similar to that of pigs fed a control diet with fish meal as the protein source (542g/day). However, without addition of lysine to the SPL diet daily live-weight gain was



only 482g/day. It is concluded that SPL can be considered as a potentially valuable protein source for pigs. The leaves can be used fresh, dried or as silage, and can replace fish meal and groundnut cake as a protein source for growing pigs under small farm conditions in central Vietnam.(An, Le Van, 2004).

Although bananas (*Musa cavendishii*) and plantains (*Musa paradisiaca*) are mainly used as human food, a considerable amount of reject fruit could be fed to livestock, particularly to pigs. The vegetative part of the plant, the pseudo-stems and leaves, contains more than 60% of the dry matter of the whole plant and has been used experimentally as meal for pigs in concentrate rations (Garcia, 1991).

Gerpacio and Castillo (1979) cited that the dry matter content of banana trunk (*Musa sapientum*) is 5.27% and the dry matter content of sweet potato (*Ipomea batatas*) leaves and vines is 14.4%.



MATERIALS AND METHOD

Materials

The materials that were used in this study were nine 3 months old pigs obtained from one litter that were more or less of the same weight; chopped (Saba) banana trunk (Figure 1), sweet potato (Puerto Rican) leaves and vines (Figure 2), commercial feeds, water, weighing scale, knives, stick brooms, pigpens, disinfectants, record book and pen for recording data.

Methodology

Preparation of the pens. A week before the start of the study, the pigpens (Figure 3), including the feeding troughs as well as the whole area of the growing house were cleaned and disinfected.

Procurement of banana trunks and camote leaves and vines. The banana trunks and sweet potato leaves and vines were collected at Gaswiling, Kapangan. the place where the study was conducted. After collection, these were washed and allowed to drain. These were chopped into small pieces and weighed based on the specified amounts before giving to the pigs. These were fed together with the commercial feeds (Figure 4).

Experimental design and treatments. Following the Completely Randomized Design (CRD), the nine growers were grouped into three to compose the three treatments. Each treatment was replicated three times with one grower per replication. However, before the growers were placed into their respective pens, their weights were taken individually and recorded.





Figure 1. Chopped (Saba) banana trunk



Figure 2. Sweet potato leaves and vines



Figure 3. The experimental pig pens



Figure 4. One of the pigs fed with chopped banana trunk

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The different treatments were as follows:

T₀ = 100% Commercial Feeds (CF) control

T₁ = CF + 2 kg chopped banana trunk/day

T₂ = CF + 2 kg chopped sweet potato leaves and vines/day

Management of the pigs. All the experimental animals were subjected to the same management in all aspects except on the diet offered to them depending on the treatment where they were assigned. The control pigs were fed with pure commercial feeds. The pigs under treatment 1 were given commercial feeds plus chopped banana trunk and the pigs in treatment 2 were fed with commercial feeds plus chopped sweet potato leaves and vines. Feeding was done twice a day, one in the morning at 7:00 and another in the afternoon at 4:30. Adequate drinking water was always available and to avoid and protect the pigs from diseases, cleaning of pigpens was done every day.

Data Gathered.

The data gathered were as follows:

1. Initial weight (kg). This was the weight of the pigs at the start of the study.
2. Final weight (kg). This was the weight of the pigs at the end of the study.
3. Feed offered (kg). This refers to the amount of feeds given to the pigs each day.
4. Feed leftover. This was the amount of feeds not consumed by the pigs which was taken every morning before feeding the pigs.
5. Cost of production (Php). This refers to the cost of each of the materials used during the duration of the study.



From the data above the following parameters were computed:

1. Total gain in weight (kg). This was obtained by subtracting the initial weight from the final weight.

2. Average daily gain in weight (ADG) kg. This was obtained by dividing the total gain in weight by the number of experimental days.

3. Total feed consumption (kg). This was obtained by adding the amount of feed consumed by the pigs from the start to the end of the study.

4. Feed conversion ratio (FCR). This was obtained by dividing the total feed intake by the total gain in weight.

5. Net Profit. This was obtained by subtracting the total cost of production from the gross sales.

6. Return on Investment (ROI %). This was taken using the following formula.

$$\text{ROI} = \frac{\text{Net Profit}}{\text{Total Cost of Production}} \times 100\%$$

Data Analysis

All the data gathered were consolidated, tabulated and analyzed using the Completely Randomized Design (CRD) and treatment means were compared using the Duncan's Multiple Range Test (DMRT).



RESULTS AND DISCUSSION

Body Weights

Table 1 shows the mean initial and final weights of the pigs in the different treatments. In terms of initial weight, statistical analysis showed that there were no significant differences among the treatment means. This indicates that the pigs were more or less of the same weights at the start of the study. The over all mean initial weight of the pigs was 26.11 kg.

Table 1. Initial weight of the pigs at 90 days of age and final weights at 180 days of age.

TREATMENT FINAL	MEAN (kg)	
	INITIAL	
100% Commercial Feeds (CF) control	26.00	74.67
CF + 2 kg chopped banana trunk/day	26.00	75.17
CF + 2 kg chopped sweet potato leaves and vines	26.33	78.43

Means with no superscript are not significantly different at 5% DMRT



Figure 5. One experimental pigs at the end of the study

In terms of final weight, differences between treatment means are noticeable as shown in the Table 1; however, such differences were not enough to cause significant effects as revealed by the statistical analysis. This indicates that the final weights of the pigs in the three treatments were more or less the same. The mean final weight of the pigs ranged from 74.67-78.43 kg. The pigs at the end of the study are shown in Fig.5



Total and Average Daily
Gain (ADG) in weight

Presented in Table 2 are the total gains in weight and average daily gain (ADG) of the experimental animals. Three to both parameters, no significant differences between treatment means according to statistical analysis. This means that the gains in weight of the pigs were more or less the same. It is also reflected that the ability of the animals to gain weight has not been improved nor adversely affected by the addition of chopped banana trunk and sweet potato leaves and vines in their rations. The overall mean total gain in weight of the pigs was 49.98 kg and the mean ADG was 0.56kg.

Table 2. Total and average daily gains (ADG) in weight of the pigs at 90 to 180 days of age.

TREATMENT	GAIN IN WEIGHT (kg)	
	TOTAL	DAILY
100% Commercial Feeds (CF)control	48.67	0.54
CF + 2 kg chopped banana trunk/day	49.17	0.55
CF + 2 kg chopped sweet potato leaves and vines	52.10	0.58

Means with no superscripts are not significantly different at 5% DMRT



Total Feed Consumption

Table 3 presents the total feed consumptions of the experimental animals. Practically the pigs in all the treatments had consumed the same amount of commercial feeds as there were no feed left-over's observed on commercial feeds. The feed left-over's observed, most especially the earlier duration of the study, were actually on the chopped banana trunk and sweet potato leaves and vines.

Statistical analysis revealed highly significant differences between treatment means wherein the pigs given chopped banana trunks and sweet potato leaves and vines significantly higher feed consumptions with means of 305.20 kg and 303.83 kg, respectively compared to 127.50kg observed from the pigs in the control group. The above result is expected because the chopped banana trunk and sweet potato leaves and vines were given as feed supplements or add-ons plus the fact that there feedstuffs have high moisture contents. According to Gerpacio and Castillo, banana trunk has a dry matter content of 5.27% and 14.4% for sweet potato leaves and vines. This means that the moisture contents of both are 94.73% and 85.6%, respectively.

Table 3. Total feed consumption (as feed basis) of the pigs from 90 to 180 days of age (kg).

TREATMENT	MEAN
100% Commercial Feeds (CF) control	127.50 ^c
CF + 2 kg chopped banana trunk/day	305.20 ^a
CF + 2 kg chopped sweet potato leaves and vines	303.83 ^b

Means with no superscripts are not significantly different at 5% DMRT



Feed Conversion Ratio

Table 4 presents the feed conversion ratio of the experimental animals registered in the different treatments. Statistical analysis revealed highly significant differences among treatments. It is revealed in the table that the pigs in the control group or the given commercial feeds only were very much more efficient in converting feeds into a unit gain in weight with a mean of 2.63 compared to the pigs given commercial feeds plus chopped banana trunk and those given commercial feeds plus chopped sweet potato leaves and vines with a mean FCRs of 6.23 and 5.84, respectively. It is revealed from the results that the giving of chopped banana trunk or sweet potato leaves and vines to the pigs did not make the animals more efficient in utilizing the feeds they ate.

Returns on Investment (ROI)

Table 5 shows the different returns on investment realized from the treatments. though this was not subjected to statistical analysis, result revealed that the pigs in the control or those fed with pure commercial feeds had the highest returns on investment of 35.02%, followed by those fed with commercial feeds + 2 kg chopped sweet potato

Table 4. Feed conversion ratio of the pigs grown from 90 to 180 days of age

TREATMENT	MEAN
100% Commercial Feeds (CF) control	2.63 ^b
CF + 2 kg chopped banana trunk/day	6.23 ^a
CF + 2 kg chopped sweet potato leaves and vines	5.84 ^a

Means with a common letter are not significantly different at 5% DMRT



leaves and vines which was 26.29%; and those given commercial feeds + 2kg chopped banana trunk they had the lowest returns on investment of 21.62%.

Chopped lower ROIs were observed from the pigs given banana trunk and sweet potato leaves and vines because of the additional expenses on the above feedstuffs. Results of the study revealed that adding 2kg of chopped banana trunk or sweet potato leaves and vines into the commercial feeds fed to the growing-finishing pigs did not improve their growth rates or gains in weight. Because no improvement was observed, their addition was just an additional expense resulting to a higher total cost of production (see appendix Table 5) and hence the lower ROIs.

Table 5. Returns on Investment of the pigs at 90 to 180 days of age (%)

TREATMENT	ROI
100% Commercial Feeds, control	35.02%
CF + 2 kg chopped banana trunk/day	21.62%
CF + 2 kg chopped sweet potato leaves and vines/day	26.29%



SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to determine the effect of chopped banana trunk and sweet potato leaves and vines as feed supplement on the performance of growing-finishing pigs.

A total of 9 three months old pigs were grouped into three treatments following the completely randomized design (CRD). Each of the three treatments were replicated three times with 1 pig per replication. The different treatments were as follows: pure commercial feeds (T₀); commercial feeds + 2kg chopped banana trunk/day (T₁); pure commercial feeds + 2kg sweet potato leaves and vines/day (T₂). The banana trunk and sweet potato leaves and vines were collected and washed, allowed to drain and finally were chopped into small sizes, after which these were given to the pigs every meal. Feeding was done twice a day.

Statistical analysis revealed that there were no significant differences among treatments in the parameters namely, initial weight, final weight, gain in weight, highly significant differences, however, were observed in terms of total feed consumption, feed conversion ratio. And feed cost to produce a kg gain in body weight.

The pigs in the three treatments had an overall mean initial weight of 26.11 kg and as overall mean final weight of 79.09kg after 90 days of feeding.

As regards to the total gain in weight, the pigs in the control group had a mean of 48.67kg and an ADG of 0.54kg. The pigs given commercial feeds +2kg chopped banana trunk registered a mean total gain in weight of 49.17kg and an ADG of 0.54kg. The pigs given pure commercial feeds +2kg sweet potato leaves and vines had a mean total gain in weight of 52.10kg and an ADG of 0.58kg.



From 90-180 days old, the pigs given commercial feeds only had a mean feed consumption of 127.50kg. On the other hand, the pigs given commercial feeds plus 2kg chopped banana trunk had a mean feed consumption of 305.20kg and 303.83kg for the pigs given commercial feeds plus 2kg chopped sweet potato leaves and vines.

For the feed conversion ratio (FCR), the pigs given commercial feeds had a mean of 2.63 and 6.23 and 5.84 for the pigs given commercial feeds plus chopped banana trunk and for those given commercial feeds plus chopped sweet potato leaves and vines, respectively.

Finally, in terms of returns on investment (ROI), the highest ROI was observed from the pigs given a commercial feed only which was 35.02%. This was followed by the pigs fed with commercial feeds plus sweet potato leaves and vines with an ROI of 26.29%. The lowest ROI was observed from the pigs fed with commercial feeds plus chopped banana trunk which was 21.62%

For the feed conversion ratio the means observed for the T₁ (chopped banana trunk) only ranged from 6.23^a, 5.84^a in the pigs given chopped sweet potato leaves and vines, while 2.63^b observed in the pigs given with pure commercial feeds.

The above results reveal the chopped banana trunk and sweet potato leaves and vines given as supplements to growing-finishing commercial feeds is neither advantageous nor disadvantageous to the growth performance of the pigs. Particularly on the gain in weight.



Conclusion

Based from the results of the study, it can be concluded that supplementing the commercial feeds given to growing-finishing pigs with either chopped banana trunk or sweet potato leaves and vines gives no apparent effect on the body weights and to the gains in weight but had adversely affected the feed conversion ratio, and the returns on investment.

Recommendation

It is therefore recommended that chopped banana trunk and sweet potato leaves and vines may or not be used depending upon the discretion of the swine raiser as it was shown from the result of the study that no economic advantage can be obtained by utilizing this feedstuff as add-on to the concentrate diet in terms of body weight and average daily gain.

It is also recommended, however, that further studies should be conducted to include the effect of the above feedstuffs on the carcass quality most especially so that some are claiming that the meat derived from pigs fed with sweet potato leaves and vines has thinner back fat and has a better taste.



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