BIBLIOGRAPHY

INCIONG, JOVANI P. OCTOBER 2012. The Effect of Sweet Potato Meal(*Ipomoea batatas*) on the Carcass Characteristics of Swine. Benguet State University, La Trinidad, Benguet.

Adviser: Marlene B. Atinyao, PhD

ABSTRACT

The study was conducted to determine the effect of supplementing sweet potato meal on slaughter weight, carcass weight, carcass length, abdominal fat, edible entrails, whole sale cuts, back fat thickness, and loin eye area of swine.

Nine 85 - day old pigs were randomly distributed in three treatments as follows: pure commercial feeds, commercial feed with 150grams sweet potato meal, and commercial feed with 300grams sweet potato meal. The pigs were given the experimental ration until they reach 150 days of age.

Result showed that there are no significant differences on the slaughter weight, dressing percentage, carcass length, abdominal fat, edible entrails, whole sale cuts, and back fat thickness among treatments. The average dressing percentage, carcass length, back fat thickness, percent abdominal fat, and percent edible entrails obtained in hogs averaging 84kg were 70.84%, 65.61cm, 2.31cm, 1.82%, and 6.52% respectively. The percent ham, shoulder, loin, and belly were 31.53%, 29.156%, 16.51%, and 21.64% respectively. Highly significant differences were found on the loin eye area between treatments. Hogs given

300g sweet potato/kg of commercial feeds had higher loin eye area mean of 41.17cm followed by hogs given 150grams sweet potato meal/kg commercial feeds (37.75cm) and hogs fed with pure commercial feeds (36.45cm).

Generally pigs fed with pure commercial feeds and those given 150 grams and 300 grams sweet potato meal in addition to commercial feeds has the same carcass characteristics except in the loin eye area where pig given 300 grams sweet potato meal had bigger loin eye.

INTRODUCTION

The gross structure of meat consists of lean, fat, and bone. Among the three components, lean is considered as the most important since it comprises the bulk of carcass, it is about 50-60% of the carcass. Fat is the most variable component of meat. It comprises 5-30% of carcass. Older animals tend to contain higher amounts of fat. Bone, on the other hand, comprises 15-17% of the carcass (Ibarra, 1983).

Providing proper nutrition to pigs before slaughter improves carcass quality dramatically. Energy is required to support muscle growth, but excess energy intake increases fatness (Pettigrew, 1999).

Corn is widely used as main carbohydrates source of pig's diet, however, continuous effort has been made to explore the use of feedstuffs including sweet potato as an alternative energy feed resource for swine. Sweet potato is one of the most versatile nutritious foods in the Cordillera both for humans and animals, particularly swine and chicken. Sweet potato protein is high nutritive value since it contains reasonable amount of amino acids. The energy that pigs can get from the sweet potato storage root is similar to what they can get from cassava meal. Although, regular consumption of its roots and leaves has the potential of lowering the incidence of micronutrient deficiency.

Information generated from the study can provide better understanding on the effect of diet to meat composition. It can be used by swine raisers and animal nutritionist as guide in coming up with appropriate swine rations. It will also serve as reference to students and other researchers in coming up with other related studies.

Generally, this study was conducted to determine the effect of supplementing commercial ration with sweet potato meal on carcass characteristics of swine.

Specifically; it aims to determine the effect of supplementing commercial ration with sweet potato on the dressing percentage, back fat thickness, percent abdominal fat, loin eye, percent edible entrails, percent whole sale cuts, and carcass length.

This study was conducted at Banig, Tawang, La Trinidad, Benguet from October 2011 to March 2012.

REVIEW OF LITERATURE

Church *et al* (1986) stated that nutrition and feeding management is very important aspects of swine production and is extremely important that swine producers also have good understanding of nutrient requirement of pig in each phase of lifecycle. Nutritional quality is one of the factors that affects meat quality and yield (Lawrence and Fowler, 2002; Fuller, 2004).

Pork is the most widely consumed meat until today. It is rich in source of proteins and fats. This meat is being used to make sausages, ham and bacon (Fuller, 2004).

Ibarra (1983) stated that 100g of pork can provide 50% of total protein needed by the body of the production of energy. Pork contains lysine as the highest in crude protein percentage. It contains 7.8% CP followed by leucine of 7.5%, arginine 6.4%, threonine 5.1%, valine 5.0%, methionine 2.5%, tryptopan 1.4% and cystine 1.3% CP.

Pork has high mineral content of phosphorous, selenium, sodium, zinc, potassium and copper. The two minerals which are present in good quantities are Iron and Magnesium, while Calcium and Manganese are found in traces only. Pork is highly enriched with Vitamin B6, Vitamin B12, Thiamine, Niacin, Riboflavin, and Panthothenic Acid. However, Vitamin A and Vitamin E are found in very small amounts. Calorie value of pork is 458.0 per 100 grams. This is quite high when compared to other animal products like chicken (Organic Facts, 2011).

Sweet potato (*Ipomoea batatas L.*) is an important source of valorize and accepted as secondary source of carbohydrate because of its ability to produce 1.3-1.9 times the amount of edible energy/ha/day as compared to rice. It provides partly the recommended

daily allowance (RDA) for thiamine, riboflavin, niacin, ascorbic acid, and minerals (Sauvant *et al.*, 2004).

Sauvant *et al.* (2004) reported that dried sweet potato tuber that contains 87.8% dry matter has the following nutrient content: 4.25% crude protein, 2.6% crude fiber, 0,8% ether extract, 2.8% ash, 0.2% insoluble ash, 8.0% neutral detergent fiber, 4.2% avid detergent fiber, 0.8% acid detergent lignin, 64.5% starch, 6.7% total sugars, and 15.2MJ/kg gross energy.

Dominguez (1998) found out that sweet potato meal contains 5.0% of crude protein, 0.2% of calcium, 0.14% calcium, and 0.25 of phosphorous. On the other study conducted by Giang *et al* (2002) they analyzed that sweet potato root meal contain 4.0% of crude protein, 4.05 of calcium, and 23% of phosphorous in dry basis.

Yang *et al* (1975) reported that the crude protein contents of sweet potato carried from 3.5% to 7.1% on dry weight basis and that protein and lysine contents are significantly influenced by variation between varieties. The digestible energy (DE) metabolizable energy (ME) and net energy (NE) of sweet potato chips and corn for pigs have been estimated by Wu (1980) as cited by Villareal and Griggs (1982). The DE and ME of sweet potato chips were 91% of those corn while NE of sweet potato chips was only 79% of that of corn. Thus sweet potato chips are not comparable with corn as a pig diet in terms of either quantity or quality of digestible energy.

All plant parts of sweet potato are utilized as feeds for hog, cattle, rabbit, and goat. Fresh and sun dried sweet potato chips that contain about 334g crude protein and 8.5Mcal van be given daily to pigs. Sun-dried sweet potato chips are more economical than the fresh

one. Back fat is significantly thinner in pigs with diets containing sweet potato (Koh and Chen, 1979).

In Korea, sweet potato silage is utilized as feed. It was found not only a good feed for hogs but also it improves the meat quality (Jeong, 2004). Silage mixed with crushed sweet potato root and rice bran at a ratio of 80:20 (w/w) or crushed sweet potato roots, vines and leaves and rice bran at a ratio of 60:30:10 (w/w/w), and stored for one month in silos van comprise up to 60% of the total feed requirement for hog fattening.

MATERIALS AND METHODS

The materials used in the study were nine heads of swine from a previous growth study weighing 84kg approximately. They were given commercial ration supplemented with different levels of sweet potato meal consist of storage roots. Other materials used were livestock weighing scale, stunner, knives, bolo, blow torch, LPG, measuring tape, lighter, chopping board, water and basin.

Feeding Management

Sweet potato storage root were gathered and washed. After washing the sweet potato storage roots were grated then sun dried to reduce moisture content to approximately 10%.

Prior to slaughter, experimental animals were fed commercial feeds *ad libitum* for 85 days, starting from the pigs were 55 days of age until they were 150 days of age. Depending on the treatment, sweet potato meal supplement was given to the animals twice a day. Half of the desired amount was given at 7:00 am in the morning and the other half at 4:00 pm in the afternoon.

Experimental Treatments

Nine pigs were selected from a previous growth study for slaughter to represent three replicates for each of the following feeding treatments:

T_0-without sweet potato (100% commercial feeds)

T_1-Commervial feed supplemented with 150g dried sweet potato meal/kg

T_2-Commercial feed supplemented with 300g dried sweet potato meal/kg

All experimental animals were subjected to uniform slaughtering procedures. Approved practices in slaughtering in hogs as specified by Ibarra (1983) include the following:

1. Stunning. This is the process of making animals unconscious, prior to bleeding. The hog was stunned with a sledge hammer. Appropriate force was applied on the forehead at the cross section of the imaginary lines between the eyes (Figure 1).

2. Sticking. It is bleeding the animals with the use of seven-inch sticking knife. The head will be held with the left hand and sticking will be done on the hollow portion above the tip of breastbone (Figure 2).

Figure 1. Stunning the experimental animal

Figure 2. Sticking and bleeding the animal

3. Evisceration. This involved the opening the carcass up to the complete removal of internal organs from the body cavity (Figure 3).

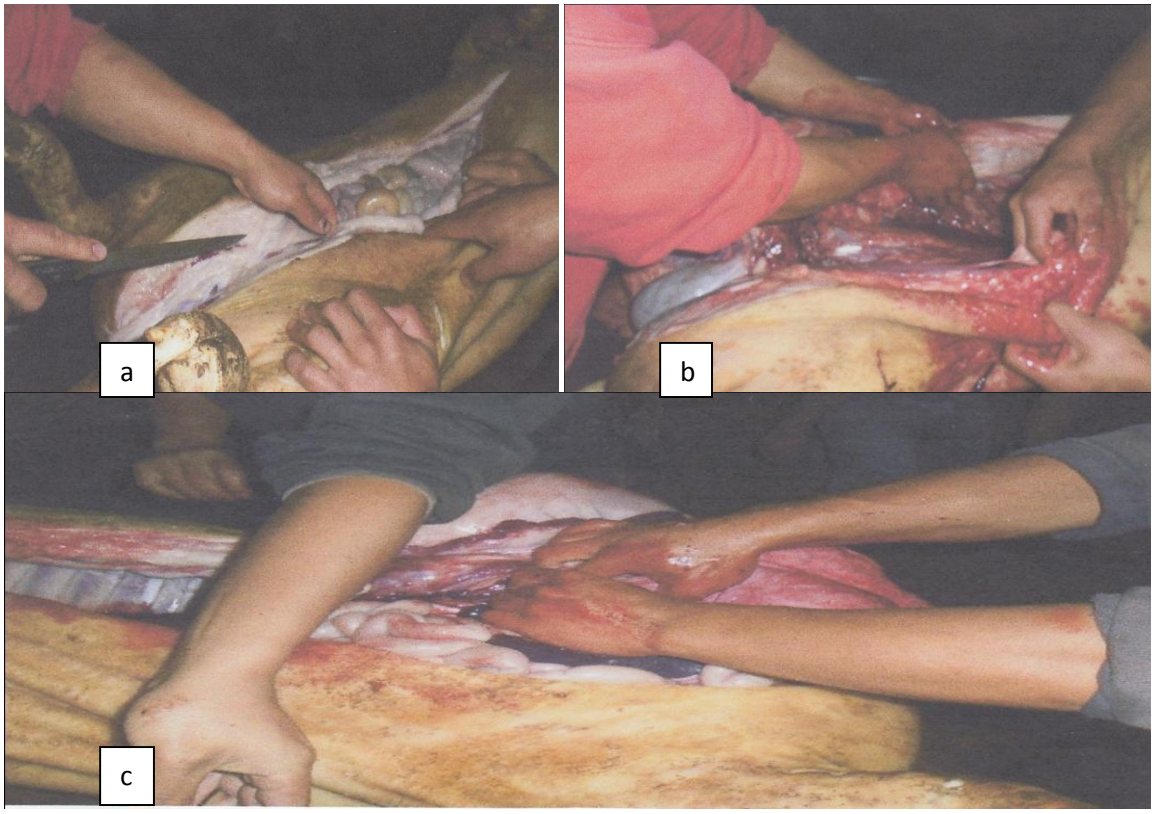

Figure 3. a) Evisceration, b) Gathering the edible entrails, c) Gathering the abdominal fat

4. Weighing the carcass. It is the process of weighing the hog after slaughtering excluding the entrails.

5. Fabrication. This is done by cutting the carcass into wholesale cuts, namely: head, feet, shoulder, ham, belly, and the loin.

Data Gathered

1. Slaughter and Carcass Data

a. Slaughter weight (kg). This was obtained by weighing the animals prior to slaughter using livestock scale after 24 hours of fasting (Figure 4).

Figure 4.Weighing the experimental animal at 150 days of age

b. Carcass weight (kg). It is the weight of the carcass without head, feet and the entrails.

c. Weight of wholesale cuts (kg). The carcass was fabricated into wholesale cuts and then each cut were weighed individually (Figure 5).

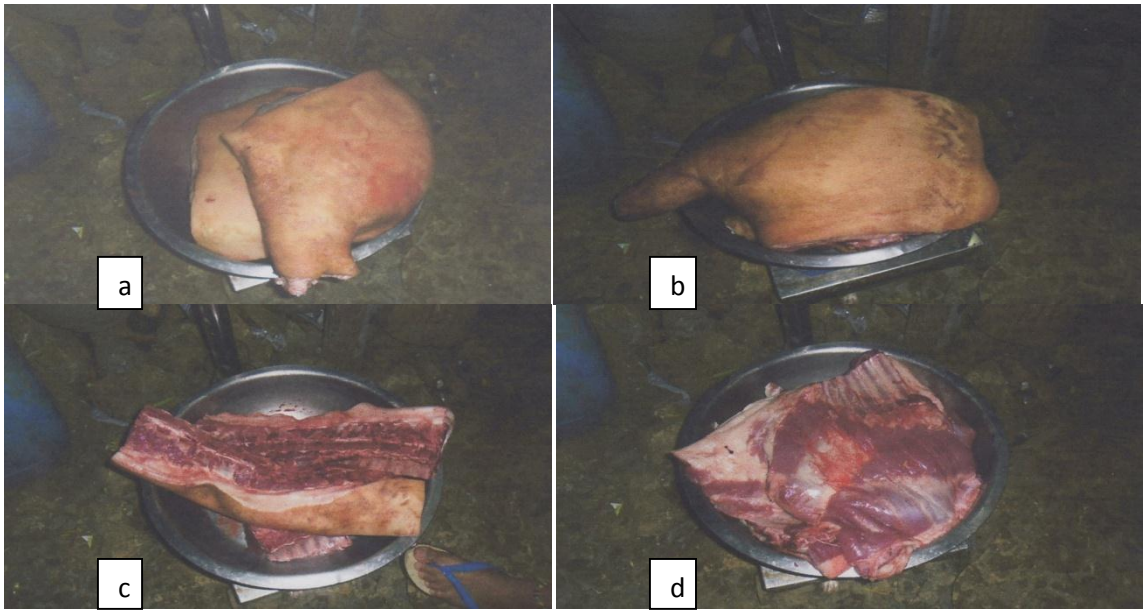

Figure 5. Weighing the ham (a), shoulder (b), loin (c), and belly (d) of the slaughtered hogs

d.Weight of edible entrails (kg). Edible entrails were separated from the carcass and were weighed. Edible entrails consist of heart, liver, lungs, spleen, kidneys, pancreas, and intestines.

2. Carcass Measurement.

a. Back fat measurement (cm). This was obtained by the measurements made opposite the first rib (P_1), last rib (P_2) and the last lumbar vertebra (P_3) of the splitted carcass (Figure 6).

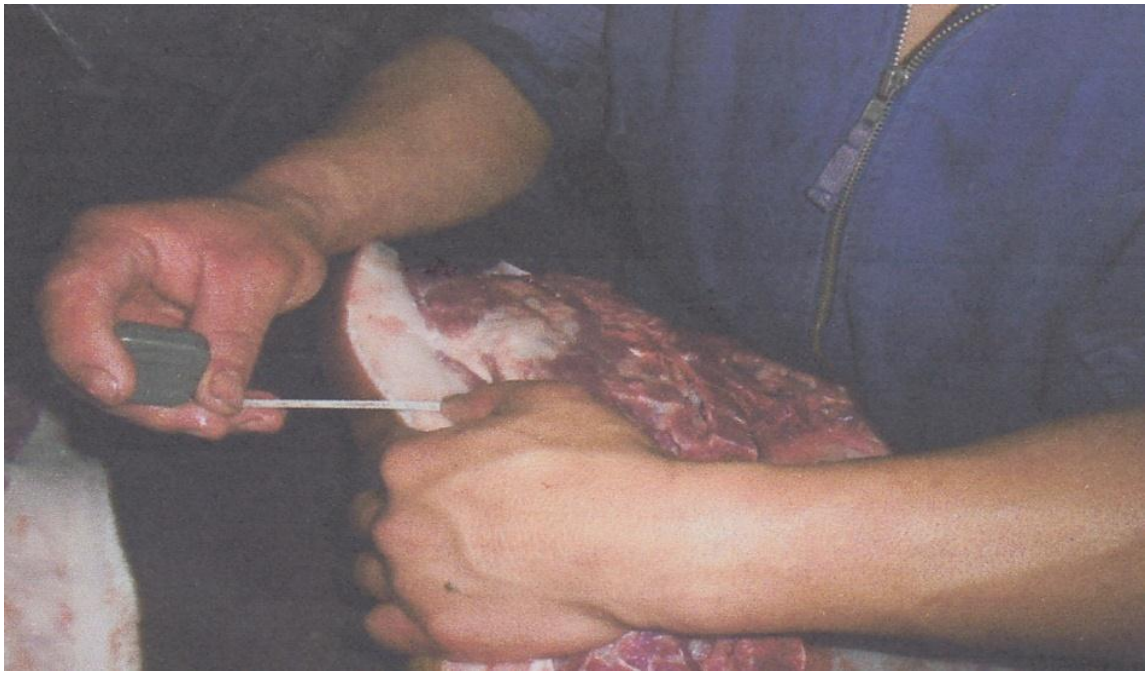

Figure 6. Measuring the back fat thickness of the slaughtered hog using a tape measure

b. Carcass length (cm). This was measured from the dorsal tip of the exposed part of the symphysis pubis to the forward edge of the first rib (Figure 7).

c. Loin eye area (cm^2). This was taken by cutting the loin between the tenth and eleventh rib, the muscle area was carefully traced on an acetate paper. The area was determined using the formula length x width x 0.8. Length was the longest straight line that

can be made within tracings while the width was the straight line that bisects the length at right angle (Figure 8).

Figure 7. Measuring the carcass length of the slaughtered hog using a tape measure

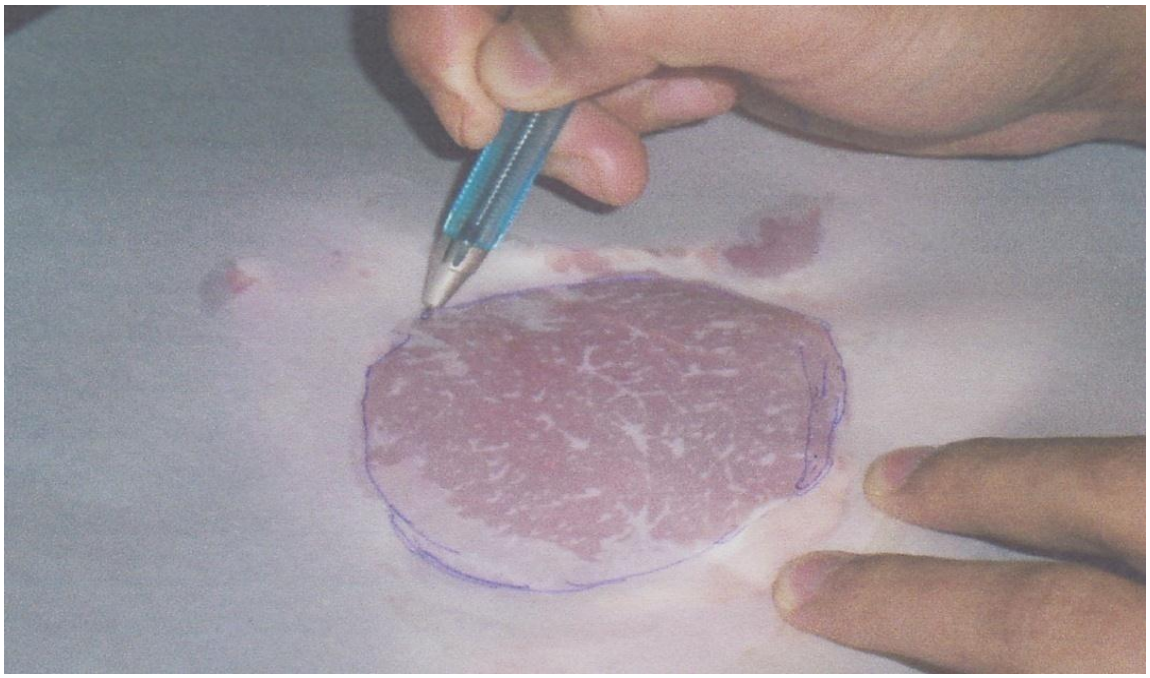

Figure 8. Measuring the loin eye area of the slaughtered hogs using an acetate paper

Data Computed

From the above data, the following parameters were computed:

1. Dressing percentage. This was computed using the formula:

$$\text{Dressing percentage} = \frac{\text{Carcass weight}}{\text{Slaughter weight}} \times 100\%$$

2. Percent whole sale cuts. This was computed using the formula:

$$\text{Percent wholesale cuts} = \frac{\text{Cut weight}}{\text{Slaughter weight}} \times 100\%$$

3. Percent edible entrails. This was computed using the formula:

$$\text{Prevent edible entrails} = \frac{\text{Weight of edible entrails}}{\text{Slaughter weight}} \times 100\%$$

4. Percent abdominal fat. This was computed using the formula:

$$\text{Percent abdominal fat} = \frac{\text{Weight of abdominal fat}}{\text{Carcass weight}} \times 100\%$$

5. Back fat thickness. This was determined by computing the average of back fat measurement taken at P_1 (first rib), P_2 (last rib) and P_3 (lumbar vertebra).

Data Analysis

Data gathered and computed was analyzed using the analysis of variance for Completely Randomized Design (CRD) and the Duncan's Multiple Range Test was used to compare treatment means.

RESULT AND DISCUSSION

Slaughter Weight , Carcass Weight and Dressing Percentage of Hogs

Table 1 shows the slaughter weight, carcass weight, and the dressing percentage of the slaughtered hogs. Statistical analysis showed no significant differences in the data from hogs fed with pure commercial feeds(CF) and those given 150g and 300g of sweet potato meal per kilogram of commercial feeds.

Dressing percentage of slaughtered animals is an indicator of carcass yield. The average dressing percentage of hogs used in the study was 70.84% for hogs weighing about 84kg slaughter weight. This is relatively higher than the dressing percentage of 69.93% reported by Ibarra(1983) from hogs with a slaughter weight of 87.80kg. The small discrepancy may be due to the condition of carcass when the carcass weight were taken. In this study, carcass weght was taken from a freshly slaughtered hog while that of Ibarra (1983), it was taken from a chilled carcases. It has been reported that carcass weight tends to decrease by 2% after it has been chilled (Ibara, 1983).

Table 1. Dressing percentage of hogs as affected by supplementing swine rations with sweet potato meal

TRATMENTS	SLAUGHTER WEIGHT (kg)	CARCASS WEIGHT (kg)	DRESSING PERCENTAGE
100% commercial feeds	84.00[a]	60.37[a]	71.87[a]
CF plus 150g sweet potato	84.33[a]	59.36[a]	70.34[a]
CF plus 300g sweet potato	83.67[a]	58.82[a]	70.30[a]

Means with common letters are not significantly different at 5% level by DMRT

Percent Weight of Cuts

Table 2 shows the weight of shoulder, ham, belly, and loin expressed as percent of the slaughter weight of hogs with an average slaughter weight of 84kg. Statistical analysis showed no significant differences in the percent shoulder, ham, belly, and loin of hogs given commercial feeds and those given 150g and 300g sweet potato meal per kilogram of commercial feeds. The average percent of ham, loin, belly, and shoulder of 84kg hogs were 31.53%, 16.49%, 21.64%, and 29.23%, respectively. These values compared to the standard average yield reported by Ibarra (1983), having a percent of 15.99% shoulder, 16.74% loin, 19.20% ham, and 16.37% belly having a slaughter weight of 87.80 kilograms.

Percent Abdominal Fat and Percent Edible Entrails of Slaughtered Hogs

Table 3 shows the weight of abdominal fat and edible entrails of hogs expressed as percent of slaughter weight. After statistical analysis, percent abdominal fat and percent edible entrails were not significantly different.

Table 2. Weight of whole sale cuts expressed as percent of carcass weight

TRATMENTS	PERCENT SHOULDER	PERCENT HAM	PERCENT LOIN	PERCENT BELLY
100% commercial feeds	28.74[a]	30.73[a]	15.80[a]	21.08[a]
CF plus 150g sweet potato	28.97[a]	32.04[a]	17.36[a]	21.96[a]
CF plus 300g sweet potato	29.74[a]	31.82[a]	16.37[a]	21.88[a]

Means with common letters are not significantly different at 5% level by DMRT

Table 3. Abdominal fat and edible entrails as percentage of carcass weight

TRATMENTS	PERCENT ABDOMINAL FAT	PERCENT EDIBLE ENTRAILS
100% commercial feeds	2.01[a]	6.06[a]
CF plus 150g sweet potato	1.78[a]	6.85[a]
CF plus 300g sweet potato	1.66[a]	6.66[a]

Means with common letters are not significantly different at 5% level by DMRT

Carcass Length, Back Fat Thickness, and Loin Eye Area

Table 4 shows the average carcass length, average back fat thickness, and average loin eye area. The average carcass length from the three treatments was 65.50cm, 66.50cm, and 64.83cm respectively. Carcass length is often included as a measure of carcass yield. Heavy and long loins are obtained from long carcasses (Ibarra, 1983).

Statistical analysis showed no significant differences on the back fat thickness of slaughtered hogs. However, the loin eye area had highly significant differences. Animals supplemented with 300 grams of sweet potato meal produced bigger loin eye compared to the pigs fed with pure commercial feeds or 150g sweet potato meal/kg of CF. Meanwhile, the pigs in the control had comparable loin eye to those fed 150g sweet potato meal and commercial feeds. The loin eye area is highly correlated with all measures of meatiness including the ham, loin, and shoulder weights individually or collectively. This trait has a high negative correlation with back fat thickness (Ibarra, 1983). The higher the loin eye area, the better the carcass characteristics of animals.

Table 4. Other carcass measurements

TRATMENTS	CARCASS LENGTH (cm)	BACK FAT THICKNESS (cm)	LOIN EYE AREA (cm^2)
100% commercial feeds	65.50[a]	2.50[a]	36.45[b]
CF plus 150g sweet potato	66.50[a]	2.17[a]	37.75[b]
CF plus 300g sweet potato	64.83[a]	2.25[a]	41.17[a]

Means with common letters are not significantly different at 5% level by DMRT

SUMMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to determine the effect of sweet potato meal on dressing percentage, whole sale cuts, abdominal fat, edible entrails, back fat thickness, carcass length, and loin eye area. A total of 9 hogs were grouped into three treatments fed with different levels of sweet potato meal in which each treatment has three replicates. After weighing, the hogs were bled by jugular puncture. Following scraping and evisceration, the carcasses were weighed. Whole sale cut measures including back fat thickness and carcass length were collected. Abdominal fat and edible entrails were also weighed. Loin eye area was measured and calculated using formula length x width x 0.8.

Data were analyzed as Completely Randomized Design using analysis of variance. Duncan's Multiple Range Test was used for pair comparison of means.

Result showed that there are no significant differences on the slaughter weight, dressing percentage, carcass length, abdominal fat, edible entrails, whole sale cuts, and back fat thickness among treatments. The average dressing percentage, carcass length, back fat thickness, percent abdominal fat, and percent edible entrails obtained in 84kg average hogs were 70.84%, 65.615, 2.31cm, 1.825, and 6.52%. The percent ham, percent shoulder, percent loin, and percent belly were 31.53%, 29.15%, 16.51%, and 21.645. Highly significant differences were found on the loin eye area between treatments. Hogs given 300gams sweet potato meal/kg of commercial feeds have the highest mean of 41.17cm followed by hogs given 150grams sweet potato meal/kg commercial feeds (37.75cm), and hogs fed with pure commercial feeds (36.45).

Conclusion

From the result of the study, sweet potato is good feed supplement to swine ration because it contains the necessary nutrient needed by the pigs for its optimum carcass characteristics.

Recommendation

Based on the findings, sweet potato meal could be used as feed supplement although it has no significant effect on most of the carcass yields. Large amount of sweet potato given to animals improves the carcass yield of the slaughtered animals.

LITERATURE CITED

CHURCH, D. V., D. W. CASSARD and M.J. GENSON. 1986. Approved Practices in Feeds and Feeding. Danville, Illinois; luterstate.P. 368.

DOMINGUEZ, F. B. 1998. An approach to the nutritional value for pigs of sweet potato vines (Ipomoea batatas (1.) 1am). Livestock Research for Rural Development. Volume 9 Number 2. Retrieved August 20, 2011 from http://www.Cipav.org.co/lrrd/lrrd9/z/92. htm.

FULLER, M.F. 2004. The Encyclopedia of Farm Animal Nutrition. Rowett Research Institute. Aberdeen. UK. Retrieved August 18, 2011 from www.ciwf.org.uk.

GIANG, H. H., V. L. LY and B. OGLE. 2002. Evaluation of Digestibility of Mixture of Sweet potato Vines and Roots in Booth Silage and Dry Form by F_1 Crossbreed Fattening Pigs. Department of Animal Nutrition and Management Swedish University of Agricultural Science Uppsala. Sweden. P. 132

IBARRA, P. I. 1983. Meat processing for Small and Medium Scale Operation. Laguna. U.P. Los Baňos. Pp. 9, 120-121, 139-141, 143.

JEONG, B. C. 2004. Various forms of Utilization and Breeding of Sweet Potato in Korea. International Society for Horticultural Science. Retrieved September 4, 2011 from www.actahort.org/books/703/703_13.htm.

KOH, K. F, and C. P. CHEN. 1979. Studies on the Utilization of Sweet Potatoes Chips and Cassava pomace for Swine. J. Agric. Ass. China. Pp. 45-54.

LAWRENCE, T. L. J. and V. R. FOWLER. 2002. Growth of Farm Animals. Second Edition. University of Liverpool. UK. P. 91.

ORGANIC FACTS. 2011. Nutritional value of Beef and Pork. Retrieved August 24, 2011 from http://www.Organicfacts. Net.

PETTIGREW. J. E. 1999. Pettigrew Consulting International. LLC, Louisiana, USA. P.87.

SAUVANT, D., J. M. PEREZ and G. TRAN. 2004.Tables of Composition Value of Feed Materials. INRA. Paris. France. P. 208.

VILLAREAL, R. L. and T. D. GRIGGS 1982.Sweet potato. Proceeding of the First International Symposium. Asian Vegetable Research and Development Center. Shanhua, Tainan, Taiwan, China. P. 385.

YANG, T. H., TAI, Y. C., SHEN, H. S., KO, S. W. and BLACKWELL, R. O. 1975.Protein content and its amino acid distribution of locally produced and sweet potato in Taiwan. (in Chinese). 5. Chinese Agric. Chem. Soc. Pp. 132-138.