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Growth Performance of Native Swine (*Sus domesticus*) Fed with Corn Bran, Grated Coconut and Processed Banana Pseudostem

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Abstract

Native swine (*Sus domesticus*) is one of the most economical livestock to grow among backyard raisers for its highly adaptable traits to any condition and management. This study aimed to evaluate the growth performance of native swine fed with corn bran, grated coconut, and processed banana pseudostem. This study utilized twenty (20) weaned native piglets. They were arranged in Randomized Complete Block Design and subjected to five ration treatments: T1- 100% Corn bran as Control, T2- 50% Corn bran + 50% Grated coconut, T3- 50% Corn bran + 50% Processed banana pseudostem, T4- 50% Corn bran + 25% Grated coconut and 25% Processed banana pseudostem and T5- 60% Corn bran + 20% Grated coconut and 20% Processed banana pseudostem. Results revealed no significant differences among treatment means on the initial weight, final weight, average daily gain, monthly weight gain, and the total weight gain of native swine. However, an increasing trend on the final weight, average daily gain, monthly weight gain, and total weight gain were observed in T5. Results also revealed that the structural growth of native swine in the initial, final, and total increment of height, heart girth, and body length was not significantly different among the treatment means. However, highly significant results were observed in the total feed intake with those fed with T2, having the highest feed intake (51,839.80 grams). On the other hand, significant results were observed in the feed conversion ratio with those fed with T2 by a 3.37 Feed Conversion Ratio. Blanket feeding of indigenous feed materials suggested compensating for the lesser effects of experimental feeds, confirming or negating the non-significant finding in some of the study parameters.

Keywords: backyard raising, blanket feeding, heart girth, indigenous feeding, livestock

Introduction

Swine raising in the Philippines is a modern enterprise (FILENTREP, 2007) and one of the livestock ventures where most farmers are engaged in as of the moment (PCARRD, 2008), which accounted for 80% of the total livestock production (Lapus, 2009). Philippine native pigs are traditionally known as best for *lechon* or roasted pig, which commands a reasonable price and is highly preferred by food connoisseurs during special occasions (PCARRD-DOST, 2010). Production of native pigs can be a viable alternative for swine producers who cannot cope with the high price of commercial swine feeds. Hence, this animal can be raised without chemical inputs and has high economic potential for those engaged in organic swine production (Pig333, 2010).

Good feed is necessary for growth, body maintenance, and meat production. The use of less expensive and locally available feeds still these can be nutritionally complete when adequately prepared (FAO, 2014). Many alternative feeds that are potentially cost-effective and useful in swine rations are produced by the industries involved in grain milling, fruit and vegetable processing, and by-products from these industries. These are regularly used in manufactured feed to provide the required nutrients at a reduced cost (Boggess et al., 2014). Maize or corn is an excellent animal feed (THEPIGSITE, 2016) and is the traditional energy source in swine diets (Jones, 2016). Corn bran is a by-product of corn milling, commonly used by farmers as animal feeds either pure or mixed with any indigenous feed material available in the community. Corn or maize bran is sold as livestock feeds (Feedipedia, 2014) and is a useful energy source in swine diets (NCSU, 2014).

On the other hand, coconuts are also a common feed for local livestock (Agoun, 2018). Grated coconut is also one of the alternative feed sources of backyard farmers for utilization (Cabdirect, 2014). The fresh coconut flesh has been used as feed to pig and poultry with good results (Feedipedia, 2014). While banana pseudostem can be an essential staple feedstuff for pigs (DuPonte et al., 2016). It has been used experimentally as a meal for pigs in concentrate rations (Feedipedia, 2014). Banana

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pseudostems can be fed to animals in fresh (Heuze et al., 2016), and the best way of feeding fresh is to chop them (FAO, 2010).

Crisis in food production was observed today. Many farmers are experimenting and always on the lookout for any alternatives in uplifting their economic condition. The majority of them are crop farmers; therefore, livestock production is generally viewed as complementary to their leading enterprise, a crop (PCARRD, 2008). The escalating cost of feed resources is fast becoming prohibitive to livestock raisers. This problem led the researcher to the direct efforts of optimizing the potential of these locally available feed materials like corn bran, grated coconut, and processed banana pseudostem. This study aimed to help native swine raisers minimize feeds' expenses by having these cheap, locally available feedstuffs as an alternative to the expensive commercial feeds. The result may also provide information to everyone regarding the practicality of using these feed materials, especially in mitigating climate change.

Materials and Methods

This study was conducted at Ozamiz City, Misamis Occidental, Philippines, and laid out using a Randomized Complete Block Design (RCBD). The five treatments were replicated four times, as shown in Table 1.

Table 1. The experimental layout of the study.

Treatments	Combinations
Treatment 1 (T_1)	Control CB (100%)
Treatment 2 (T_2)	CB (50%) + GC (50%)
Treatment 3 (T_3)	CB (50%) + PBP (50%)
Treatment 4 (T_4)	CB (50%) + GC (25%) & PBP (25%)
Treatment 5 (T_5)	CB (60%) + GC (20%) & PBP (20%)

Where : CB = Corn Bran PBP = Processed Banana Pseudostem
GC = Grated Coconut

There were 20 grown native piglets used in the study following the specified treatments and replications. The animals were randomly distributed in their designated pens, where they were confined throughout the study's 90-days duration.

Upon the animal's arrival, fecalysis was made to establish their worm-load. These animals were dewormed to reduce, if not eliminate, their internal parasites. Vitamin ADE supplementation was also provided. Similarly, hygiene and sanitation are strictly observed daily to keep the animals away from any disease causing-microorganisms.

The percentage compositions of feedstuffs such as corn bran on a dry weight basis were accounted for protein (9.75%), ash (2.96%), total nitrogen (1.56%), and dry matter (90.93%) which are based on sun-dried samples. Grated coconut (also on a dry weight basis) contains protein (7.50%), ash (2.38%), total nitrogen (1.20%), and dry matter (95.06%), which is also based on sun-dried samples. The pounded banana pseudostem (again on a dry weight basis) contains protein (4.78%), ash (15.83%), total nitrogen (0.765%), and dry matter (82.56%) in which again was based on sun-dried samples (SPAL, 2012).

The feeds used in this study were corn bran, grated matured coconut, and processed banana pseudostem. The corn bran was bought from a nearby mill while the coconut was taken from the study area. Collected matured coconuts were freshly grated per feeding as part of the ration. The banana pseudostem used was of cardava variety and was taken from the study site and the neighboring places. Banana pseudostem was freshly processed by slicing it thinly and was then pounded using a wooden mortar and pestle. All these feed ingredients are made into a ration following the specific assignments per treatment. An ordinary table salt added with limestone feed grade was used as a mineral lick to supplement the feeding to maintain their body and legs' strength. Freshwater is made available all the time for the animals to drink. On the other hand, drinking and feeding troughs were installed in each pen to minimize the given rations' wastage.

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The feed materials used in the study were subjected to sampling for nutrient analysis to determine their digestibility in native swine. Fecal samples also were taken to quantify digestibility. The ration preparation of the animals was done per feeding to ensure freshness of feeds. Animals fed three times a day following the schedule of 6-7 o'clock in the morning, 11-12 o'clock at noon, and 4-5 o'clock in the afternoon, respectively. The amount of ration per feeding was started at 1-2 kg for animals which were still below 10 kgs. The moment they reached 11 kgs or up, each was provided with 2 – 2.5 kgs of ration.

Upon the start of the study, each animal's initial weight and structural body configuration were taken, such as heart girth, body length, and height. To minimize the animals' stressful condition, weighing and measuring the structural growth rate was scheduled monthly. After the three months of the study, the final weight gained was taken to decide on the final weight and structural growth rate.

The other generated data are as follows;

1. Weight gain: This is the difference between the final weight minus the initial weight.
    a. Average daily weight gain- This is the average weight gain from the total weight gain divided by 90 days of raising.
    b. Monthly weight increment- This is the difference between the current weight minus the last recorded weight.
    c. Total weight gain- This is the difference between the total final weight minus the total initial weight.
2. Feed offered and refused: Feed offered daily and refused taken. The feed refused was deducted from the feed provided to know the animal's feed consumption or daily feed intake.
3. Growth rate - Heart girth, body length, and height increment changes taken monthly to determine animals' growth performance.
4. Parasitic Evaluation - Fecal matters of animals checked for any presence of internal parasites as possible effects of feeding corn bran, grated coconut, and processed banana pseudostem.

The variance (ANOVA) analysis for a Randomized Complete Block Design was used to statistically analyze the data and the Duncan Multiple Range Test for comparing significant differences among the treatments means.

Results and Discussions

Growth Performance

Results of the initial weight of experimental native swine (Table 2) were not significant. It indicates the homogeneity of the experimental animals as this reflects no statistical differences among the treatment means. Genetically, native pigs are small; thus, the initial weight data (368 gm to 454 gm) are not unusual. Masangkay et al. (2013) mentioned that weights of young native pigs (13 to 73 days) are to be from 2 to 13 kg.

Table 2. Production performance of native swine (*Sus domesticus*) fed with corn bran, grated coconut, and processed banana pseudostem on initial, final, daily, monthly & total weight gains.

Treatment	Initial weight (gm)	Final weight (gm)	Ave. daily gain (gm)	Monthly weight gain (gm)	Total weight gain (gm)
T1 (Corn bran alone)	368.00	8,500.00	5.17	155.00	465.00
T2 (50% CB + 50% GC)	420.00	7,250.00	3.08	92.50	278.00
T3 (50% CB + 50% PBP)	454.00	10,000.00	5.67	170.50	511.00
T4 (50% CB + 25% GC + 25% PBP)	426.00	8,750.00	4.90	147.00	441.00
T5 (60% CB + 20% GC + 20% PBP)	444.00	10,500.00	6.67	200.25	601.00
F-test	ns	ns	ns	ns	ns
CV (%)	8.00	15.00	26.00	25.00	26.00

ns - not significant
cv – coefficient of variation
CB – Corn Bran
GC – Grated Coconut
PBP – Processed Banana Pseudostem

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Final Weight. There were no significant differences seen in the final weight of native swine fed either corn bran, grated coconut, and processed banana pseudostem for 90 days. This result shows that the final weights were not so varied (Table 2). However, slightly higher final body weight (10,500 gm) was observed among the five treatment means in Treatment 5 with 60% corn bran + 20% grated coconut and 20% processed banana pseudostem. The lowest (7,250 gm) was observed in Treatment 2, with 50% corn bran + 50% grated coconut. This result implies that native swine being an omnivore animal, prefers more concentrate feeds with little fiber in their diet. By the anatomical classification, pigs or swine are simple stomached, or they are monogastric animals. Because of this, they should be provided with readily digestible feeds. Feeding pounded/chopped banana pseudostem to swine should be done in a supplemental manner and mixed with other feed ingredients to make it a good ration (Arganosa,1997). The work of IIRR (1992) stated that native pigs could have a carcass weight of 40 kg. At 7-9 months of age.

Similarly, with final weight, non-significant differences among the five-treatment means were observed in the daily, monthly, and total weight gain of native swine within 90 days of study.

The average daily gains of the experimental native pigs ranged from 3.08 gm (Treatment 2) to 6.67 gm (Treatment 5). Although these differences are not conclusive due to the non-significant result, one could think this could be due to the kind of feed received by the experimental pigs. This result means that the 50% grated coconut is given to pigs in (Treatment 2), which is a bit higher 50% GC mixed with 50% CB in a native swine ration has resulted to a slightly lower average daily gain as compared to those fed with 60% CB + 20% GC + 20% PBP.

Monthly weight gains and total weight gains were not significantly different among treatments, although the trend is almost similar in final weight and average daily gain. Treatment 5 pigs have slightly better monthly weights and total weight gain (200.25 gm, 601.00 gm) with those in Treatment 2, providing lower weights and gains (92.50

gm, 278.00 gm). There is a lack of weight and related performances of Philippine native pigs.

Final height, heart girth, and body length growth are a change in mass and size. Table 3 shows no- significant differences among the five treatment means for the final height, heart girth, and body length of native swine within the three months of study. Such is also the case with the total increment of the height, heart girth, and body length. However, slightly taller final height and longer body length were seen in pigs at Treatment 3 with 35.50 cm and 50.00 cm, respectively. Treatment 3 pigs were fed with a ration containing 50% corn bran + 50% processed banana pseudostem. For the final heart girth, a slightly higher (50.50 cm) measurement was in Treatment 5. Treatment 5 pigs were fed with a ration of 60% corn bran + 20% grated coconut + 20% processed banana pseudostem.

Table 3. Production performance of native swine (*Sus domesticus*) fed with corn bran, grated coconut and processed banana pseudostem on total height, total heart girth & total body length increments.

Treatment	Final Height (cm)	Total Height (cm)	Final Heart Girth (cm)	Total Heart Girth (cm)	Final Body Length (cm)	Total Body Length (cm)
T1 (Corn bran alone)	32.50	7.25	45.50	9.75	46.30	9.50
T2 (50% CB + 50% GC)	31.30	5.75	44.50	6.25	45.30	9.80
T3 (50% CB + 50% PBP)	35.50	9.25	47.00	9.00	50.00	10.50
T4 (50% CB + 25% GC + 25% PBP)	33.50	7.25	49.30	11.25	47.00	8.50
T5 (60% CB + 20% GC + 20% PBP)	33.00	5.00	50.50	13.00	49.80	11.00
F - test	Ns	ns	ns	ns	ns	ns
CV (%)	5.00	24.00	5.00	26.00	4.00	10.00

ns - not significant
cv – coefficient of variation
CB – Corn Bran
GC – Grated Coconut
PBP – Processed Banana Pseudostem

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In the total increment of heart girth and body length, pigs in Treatment 5 alone posted slightly higher (13 cm and 11 cm, respectively). For the total increment of height, Treatment 3 animals gave a slightly higher (9.25 cm) result.

Lower performances in the final height, heart girth, and body length were seen in Treatment 2 pigs with 31.30 cm, 44.50 cm, and 45.30 cm, respectively. In contrast, for the total increment of height, pigs in Treatment 5 were shorter (5.00 cm), while lesser heart circumference (6.25 cm) was observed in Treatment 2. Body length (8.50 cm) was shorter in Treatment 4 (50% corn bran + 25% grated coconut + 25% processed banana pseudostem). These results point out that feeding corn bran, grated coconut, and processed banana pseudostem has an inconsistent effect on the structural growth of native swine in the three months of study. However, the non-significant differences do not warrant that these different feed ingredients in the ration caused such performances.

The importance of the anatomical structural measurement in pigs is that it provides an additional basis for growth. In particular, the heart girth being squared and multiplied with the body length divided by 400 will yield an estimated body weight (Kountrylife, 2013). This information could be very well used by native pig raisers who may not have weighing scales but could readily access tape measures or ruler for length measurements.

Table 4 shows the total feed intake of experimental native pigs. highly significant differences ($P<.01$) were seen in the total feed intake and feed conversion ratio. Treatment 2 (50% corn bran + 50% grated coconut) had statistically lower intake of only 23,511.80 gm for the whole feeding duration while Treatments 3, 5 4 and 1 had 51,839.80, 50,780.80, 39,550.50 and 38,900.30 grams respectively.

Table 4. Total feed intake (gm) and feed conversion ratio of native swine (*Sus domesticus*) fed with corn bran, grated coconut, and processed banana pseudostem.

Treatment	Total Amount of Feed Intake (gm)	Feed Conversion Ratio (FCR)
T1 (Corn bran alone)	38, 900.30[ab]	4, 705.40[ab]
T2 (50% CB + 50% GC)	23, 511.80[b]	3, 375.80[b]
T3 (50% CB + 50% PBP)	51, 839.80[a]	5, 642.00[a]
T4 (50% CB + 25% GC + 25% PBP)	39, 550.50[a]	4, 656.60[ab]
T5 (60% CB + 20% GC + 20% PBP)	50, 780.80[a]	5, 274.60[a]
F-test	**	*
CV (%)	28.00	18.00

* =significant
**=highly significant
cv=coefficient of variation

Coconut meat may contain higher metabolizable energy (ME). For a fact, coconut oil contains 8,000 Kcal/kg ME, thus with grated fresh coconut, and this may yield a lower than 8,00 Kcal ME but not too little. In diets with high energy levels, pigs tend to consume lesser feed because the ration provides the animal's energy requirement with that volume. This condition may be why pigs feed ration with 50% corn bran, and 50% grated coconut consumed the least amount of feed.

Feed Conversion Ratio (FCR) of the experimental pigs, however, was best in Treatment 2 (50% corn bran + 50% grated coconut) where a native pig needed only 3,375.80 gm of ration to produce a kilogram of weight (Table 6). Such performance is significantly different (P<.05) to those in Treatment 3 (5,642.00) and Treatment 5 (5,274.60). Treatments 1 (4,705.40) and Treatment 4 (4,656.60) were statistically similar to Treatment 3 and Treatment 5. With these results, Treatment 2 might have provided a better nutrition plan to the native pigs compared to those in the other treatments.

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The non-significant differences among the treatment mean in the production performance as to the average daily weight gains, monthly weight gains, and the total weight gains of native swine suggest that each ration does not influence animal performance in these parameters. The performance in treatment 5 with 60% corn bran and Treatment 1 with 100% corn bran in the weight evaluation parameters implies higher energy and protein feeds, bringing a more massive animal body. Protein and energy are essential nutrients for the growth of pigs (Cromwell, 2015). Mwesigwa (2012) indicates that growing pigs' comparable performance with fed cereal bran and full-grain diets are real. Daily gain averaged with 0.23, 0.31, and 0.13 kg/day for pigs, fed with maize bran, wheat bran, and whole maize diets, respectively. Pengsawad (2018) also reported that there was no significant effect of banana on final body weight, average daily gain (ADG), average daily feed intake (ADFI), and feed conversion ratio (FCR) throughout the experimental period.

Total feed intake among treatments was highly and significantly different (P<.01) in this study. Those fed 50% corn bran + 50% grated coconut consume a lower feed volume and lower in the final weight, average daily gain, monthly weight gain, and total weight gain. This result may be due to the high amount of grated coconut with a high level of non-starch polysaccharides; hence, pigs' feed intake and growth performance become lower. Thorne et al. (1992) stated that increasing the copra meals' diet content was associated with a progressive reduction (P = 0.017) in the animals' voluntary feed intakes. However, the feed conversion ratio was unaffected by dietary treatment. With increasing inclusion of copra meal, backfat thickness decreased at points P2 (P = 0.018) and P1 + P3 (P = 0.017). Besides, the use of copra meal in pig diets is limited due to its high level of non-starch polysaccharides (NSP), particularly β-mannans, which act as an anti-nutritional factor causing gut viscosity and, consequently, poor nutrient digestibility (Naldo, 2015). However, findings revealed that Treatment 5 (60% corn bran + 20% grated coconut + 20% processed banana pseudostem posted slightly better performance in the final weight among all of the treatments. Similar with the daily, monthly, and the total weight gained. In the structural growth, varied

results were seen, but non-significant differences among the treatment means were observed.

The non-significant difference recorded among the treatment means that the production performance parameters (total height, total heart girth, and total body increment) of the experimental native swine must involve the proper utilization of nutrients derived from the composition ration supplied by the experimental swine. Total height, heart girth, and body length are a change in mass and size. The growth of mass and size of swine must be affected by a proper composition of the nutrient ingredients. According to Cromwell (2015), pigs require a number of essential nutrients to meet their needs for maintenance, growth, reproduction, lactation, and other functions. This observation is supported by Merck (2008) who reported that the performance of weaning, growing and finishing pigs is related to both the quality of the diet and the amount that is consumed on a daily basis.

Conclusion

The proper nutrient composition of feedstuff can achieve good growth performance in swine. The combination of the balanced nutrient requirement will cause higher productivity. In this study, the indigenous feedstuff ration combination of 60% Corn bran + 20% Grated coconut + 20% Processed banana pseudostem is a better combination for native swine than other treatments. This result validates that newly weaned pigs cannot consume enough feed to meet their energy needs for protein deposition. They are in a highly energy-dependent state. Thus, any increase in energy intake results in improvements in growth rate.

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