GROWTH PERFORMANCE OF NATIVE PIGS FED WITH *TRICHANTERA* LEAF MEAL (*Trichantera gigantea*) AS PARTIAL REPLACEMENT TO BASAL DIET

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ABSTRACT

The study was conducted to assess the growth performance and economic benefits of native pigs fed diets with or without *Trichantera* leaf meal (TLM) in growing native pigs. A total of ten (10) 88 days old growing native pigs with a mean bodyweight of 5.54 ± 0.30 kg were used in the experiment and were allocated into 2 dietary treatments namely, Treatment 1 (T1) which was the basal diet (100% BD) and Treatment 2 (T2) which contains 85% BD and 15% TLM with 5 replications. Results showed that growing native pigs fed with 85% BD + 15% TLM had significantly higher ($P<0.05$) average daily feed intake (ADFI). With regards to growth performance, the body weight gain (BWG), average daily gain (ADG) and feed conversion ratio (FCR) of growing native pigs at all growth periods were found comparable. Economic benefit was also not achieved with dietary TLM inclusion. Considering that there was a significant difference in ADFI, higher inclusion of *Trichantera* may elicit a significant response in future studies.

Keywords: *Trichantera* leaf meal, native pigs, growth performance, economic analysis

INTRODUCTION

The fast-growing population in the Philippines had increased the demand for pork which led to intensive farming and the use of exotic breeds (Cabarles, 2007). The government is now promoting the use of native pigs as a product differentiation strategy that aims to target health buffs and consumers that prefer organic products. Pork consumers are becoming health conscious making organic native pig farming a popular environment-friendly alternative to the commercialized pig operation. Organic pigs, while subsisting on lower feed costs, command a higher price in the market due to their organic nature and quality meat. Despite the popularity of native pigs as a substitute for commercial breeds of pigs, there is no standard diet met that can be used to maximize its potential growth.

Although attention to swine nutrition has improved over the years, a major challenge is the increasing cost of feeds brought about by the unsteady supply of local feed

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ingredients and fluctuations in the price of imported feed ingredients. Most protein feeds for livestock are imported. The high cost of producing them is partly due to the lack of supply of local feed protein. The most common sources of protein for livestock are soybean oil meal, fishmeal, as well as meat and bone meal but are expensive and their use in animal feed also became competitive with human consumption (Jaya *et al*., 2008). Considering the unabated increase in prices of feed ingredients for commercial pigs, there is now an urgency in harvesting the potential of raising native pigs as an alternative source of animal protein. However, to popularize its production and as a potential source of livelihood to hog farmers, appropriate feeding systems and cheap but effective low-cost diets should be explored.

The Philippine native pigs are sturdy animals that can survive and reproduce under adverse environmental conditions and are more resistant to diseases (Baguio, 2017; Vicencio *et al*., 2017). They possess a unique behavior and resilience to extreme climatic conditions that are important in minimizing the cost of production which enables financially challenge farmers in the rural areas to raise pigs (DOST-PCAARRD, 2016). These pigs can be fed locally available feed resources including kangkong, kamote, copra, banana leaves and trunks, cassava, rice bran, ipil-ipil and *Trichantera*. *Trichantera* with a crude protein of 12.5 % and dry matter of 88.44 % can be a potential ingredient in the diet of native pigs and a potential substitute for some concentrate-based ingredients in the pig diet (Jaya *et al*., 2008).

Many types of research have been made on the use of locally available feedstuff to substitute the imported feed ingredients, and the outcome proved to be promising. Native pigs fed with forages proved to perform better or comparable with other conventional feedstuff namely; kangkong, kamote, copra, banana leaves and trunks, cassava, rice bran, ipil-ipil, and *Trichantera* (Jaya *et al*., 2008; Callo-Etis, 2015). Most of these feeding trials in native pigs were conducted in pregnant sows and finishers and few, if none, on native young growing pigs particularly the utilization of *Trichantera* in the diets. However, there is limited study on the use of *Trichantera* leaf meal (TLM) in diets fed to growing native pigs. Therefore, the study was conducted to assess the feeding value of TLM as a dietary supplement in growing native pigs in terms of growth performance and economic benefits.

MATERIALS AND METHODS

The study was conducted from September to December 2018 at the Native Pig Project, College of Agriculture, Central Luzon State University, Science City of Muñoz, Nueva Ecija. A total of ten (10) 88 days old growing native pigs with a mean bodyweight of 5.54 ± 0.30 kg were used in the experiment and were allocated in two dietary treatments with five replications of one pig per replicate. The dietary treatments were as follows: Treatment 1 (T1) formulated as 100% Basal diet (100% BD) and Treatment 2 (T2) formulated as 85% Basal diet + 15% *Trichantera* (85% BD + 15% TLM). The composition and calculated analysis of the experimental diets used in the study is presented in Table 1.

Trichantera leaves were harvested daily in the forage area around the vicinity of the Native Pig Project while rice bran was purchased from a feed mill within the Central Luzon State University campus. The *Trichantera* leaves were chopped into small pieces of about 1-3 cm in length using a bolo and were sun dried. The basal diet, in mash form, was prepared and mixed using a rotary-type electric feed mixer and was prepared weekly to ensure its freshness. The *Trichantera* leaves and the basal diet was weighed using a digital weighing

Table 1. Ingredient composition and calculated nutrient analysis of starter experimental diets.

Item	100% BD (%)	85% BD + 15% TLM (%)
Rice Bran	95.40	81.09
Limestone	0.90	0.77
Salt	0.50	0.43
Molasses	2.00	1.70
Poultry By-product Meal	1.00	0.85
Vitamin Premix	0.03	0.03
Mineral Premix	0.15	0.13
Antioxidant	0.02	0.017
Trichantera	-	15.00
Total	100.00	100.00
Calculated CP	12.33	12.88
Calculated Fat	12.69	11.20
Calculated Fiber	4.29	5.66

scale. A one- week adjustment period was employed to establish voluntary feed intake of the pigs. Daily feed allocation was based on the actual feed intake along the adjustment period.

The experimental pigs were placed in an open-sided house with cement flooring. They were randomly assigned to individual pens. Feeding was done twice a day at 6 a.m. and 3 p.m. Each pen was provided with a trough-type feeder. Clean and fresh water was made available at all times via a nipple drinker. The pigs were weighed individually at the beginning of the experiment and then every month using a digital weighing scale. The herd health program was in accordance with the management practices of the farm where the study was conducted.

The gathered data were the following: Average daily feed intake (ADFI), average daily gain (ADG), feed conversion ratio (FCR) and economic analysis.

1. Average Daily Feed Intake (ADFI). The daily feed intake was recorded for the whole feeding period and computed as:

$$\text{ADFI} = \frac{\text{Total feed offered (kg) - Total Left over (kg)}}{\text{Number of feeding days}}$$

2. Average Daily Gain (ADG). All pigs were weighed from the start of the feeding trial and four weeks thereafter. The average daily gain was computed as:

$$\text{ADG} = \frac{\text{Final weight (g)-Initial weight (g)}}{\text{Number of feeding days}}$$

3. Feed Conversion Ratio (FCR). The feed conversion ratio was calculated using the formula:

$$FCR = \frac{\text{Feed consumed (kg)}}{\text{Gain in weight (kg)}}$$

4. Economic Analysis.

a. Income over feed cost (IOFC) was determined as the difference between the sale value of pigs and the total feed cost. The sale value of pigs was computed based on the mean kilogram live weight of pigs multiplied by the price per kg of pigs. The total feed cost was calculated based on the mean feed consumed multiplied by the price per kg of basal diet and the *Trichantera*. Income over feed cost was calculated using the formula.

IOFC = Sale value of pigs (Php) – Total Feed Cost (Php)

b. Incremental Net Benefit. It was assessed whether by using *Trichantera* to replace a partial amount of basal diet resulted in an income rise with higher returns and lower costs, or an income decrease with lower returns and higher costs The cost of *Trichantera* leaf meal used in the experiment is presented in Table 2.

All data were statistically analyzed using *t*-Test of Statistica (StatSoft, Inc., version 7). The level of significance was set at *P*-value of <0.05.

Table 2. Cost to produce *Trichantera* leaf meal.

Item	Cost/ Kg, Php
Planting cost	3.67
Harvesting cost[1]	1.17
Chopping cost[2]	1.40
Total Production Cost	6.24
100% BD	13.36
85% BD + 15% TLM	12.37

[1]Gathering of *Trichantera* leaves took 0.16 hours.
[2]Chopping of *Trichantera* leaves took 0.20 hours.
Labor cost was priced per hour at Php 35.00.

RESULTS AND DISCUSSION

The average daily gain, average daily feed intake and feed conversion ratio of growing native pigs fed diet with or without TLM are presented in Table 3. The average daily feed intake of the pigs fed with T2 was found statistically significant ($P<0.05$). Growing native pigs' body weight increased, average daily gain and feed conversion ratio were numerically higher but statistically insignificant ($P>0.05$) during all feeding periods.

For the initial weight, a numerically higher value was recorded in growing native pigs fed with T2 with 5.63 kg compared to growing native pigs fed with T1 with 5.45 kg. For weight at 30 days, growing native pigs fed with T2 showed a higher value of 6.83 kg versus growing native pigs fed with T1 which is 6.36 kg. For weight at 60 days, growing native pigs fed with T2 was higher at 8.55 kg compared to growing native pigs fed with T1

at 7.48 kg. For weight at 90 days, growing native pigs fed with T2 has a higher value of 10.12 kg compared to growing native pigs fed T1 which is 8.74 kg. Native pigs can be fed with forage and can perform a comparable to or better performance with those on conventional feedstuff (Jaya *et al*., 2008; Callo-Etis, 2015). Sarria (1994) reported a slightly higher level of intake of *Trichantera* leaves, as a proportion of diet in pigs.

The results showed no significant difference among the treatments in terms of average daily gain. Though statistically not significant, native pigs fed with T2 had numerically higher ADG of 40g than those fed T1 with 30.5g. For ADG at 60 days, a higher value was recorded in growing native pigs fed with T2 with 48.60g compared to T1 which is 33.90g. For ADG at 90 days, growing native pigs fed with T2 was numerically higher with 49.84g compared to T1 with 36.60g. For ADG at 31-60 days, growing native pigs fed with

Table 3. Growth performance of growing native pigs fed with *Trichantera* leaf meal (TLM) as partial replacement to basal diet.

Parameters	T1 (100% BD)	T2 (85% BD + 15% LM)	*P*-value
Weight, kg			
Initial weight^{ns}	5.45 ± 0.47	5.63 ± 0.43	0.7741
Weight at 30 days^{ns}	6.36 ± 0.53	6.83 ± 0.30	0.4613
Weight at 60 days^{ns}	7.48 ± 0.51	8.55 ± 0.58	0.2019
Weight at 90 days^{ns}	8.74 ± 0.54	10.12 ± 1.04	0.2738
ADG, g/day			
0-30 days^{ns}	30.53 ± 6.85	40.00 ± 5.17	0.3020
0-60 days^{ns}	33.90 ± 8.22	48.60 ± 11.14	0.3192
0-90 days^{ns}	36.60 ± 7.53	49.84 ± 12.69	0.3955
31-60 days^{ns}	37.27 ± 11.81	57.20 ± 22.45	0.4546
61-90 days^{ns}	42.00 ± 9.78	52.33 ± 16.52	0.6050
ADFI, g/day			
0-30 days*	300.13 ± 23.85	372.10 ± 10.54	0.0247
0-60 days*	316.79 ± 17.35	414.74 ± 16.69	0.0359
0-90 days*	352.78 ± 17.20	458.76 ± 30.89	0.0171
31-60 days*	333.45 ± 18.40	457.39 ± 33.04	0.0112
61-90 days^{ns}	424.75 ± 26.53	546.79 ± 60.21	0.1007
FCR, day			
0-30 days^{ns}	9.83 ± 2.09	9.30 ± 1.64	0.5686
0-60 days^{ns}	9.34 ± 4.47	8.53 ± 2.79	0.6814
0-90 days^{ns}	9.64 ± 2.06	9.20 ± 2.73	0.8836
31-60 days^{ns}	8.95 ± 18.57	7.99 ± 17.21	0.9740
61-90 days^{ns}	10.11 ± 2.94	10.44 ± 2.89	0.7254

*Significant at $P<0.05$
^{ns}Not Significant

T2 has a numerically higher value of 57.20g compared to T1 which is 37.27kg. For ADG at 61-90 days, growing native pigs fed with T2 recorded a numerically higher value of 52.33g compared to T1 which is 42g. This conforms with the result of Jaya *et al*. (2008) who also reported no significant differences in growth parameters of native pigs fed with varying levels of *Trichantera* leaf meal.

A high average daily feed intake was obtained with growing native pigs given T2 diets. For ADFI at 30 days, a significantly higher (P<0.05) value was recorded in growing native pigs fed with T2 with 71.97g compared to growing native pigs fed with T1. For the ADFI at 60 days, growing native pigs fed with T2 showed a higher (P<0.05) value of 414.74g versus growing native pigs fed with T1 which is 316.79g. For the ADFI at 90 days, growing native pigs fed with T2 was higher (P<0.05) with 458.76g than growing native pigs fed with T1 with 352.78g. For the ADFI at 31-60 days, growing native pigs fed with T2 has a higher (P<0.05) value of 457.39g compared with growing native pigs fed with T1 which is 333.45g. For the ADFI at 61-90 days, growing native pigs fed with T2 showed a numerically higher value of 546.79g compared with growing native pigs fed with T1 which is 424.75g. The results showed that the inclusion of T2 in the diets of growing native pigs did significantly (P<0.05) influence average daily feed intake relative to the basal diet. Most tree foliage like *Trichantera* appears to be more palatable to native pigs (Rosales *et al*., 1989). For 61-90 days, the results showed that the T2 inclusion in the diets of growing native pigs did not significantly (P>0.05) affect the ADFI. The results suggested that the factor which most influenced the intake of particular tree foliage was the degree to which the animals were accustomed to eating it and highlighted the need to give the animals an adequate time to adapt to such feeds before they are able to consume appreciable quantities (Mejia and Vargas, 1993). Feed intake is dependent on the energy content of the diet (Cromwell, 2015). A higher fiber diet has lower available energy which in turn demands a higher feed intake (Harris, n.d.). However, the metabolizable energy content of the diet decreases as the fiber intake increases (Baer *et al*., 1997). It is unclear in the present study whether the higher feed intake of native pigs was due to the decreased energy content of the diet or the increased palatability of the diet.

No significant differences (P>0.05) were observed in the mean feed conversion ratio among growing native pigs fed with 15 % inclusion TLM + 85 % BD. However, growing native pigs fed with T2 showed a numerically lower feed conversion ratio than growing native pigs fed only with 100% BD. For FCR at 30 days, a numerically lower value was recorded in growing native pigs fed with T2 with 9.30 over T1 with 9.83. For the FCR at 60 days, growing native pigs fed with T2 recorded a lower value of 8.53 versus T1 which is 9.34. For the FCR at 90 days, growing native pigs fed with T2 was lower at 9.20 than T1 with 9.64. For the FCR at 31-60 days, growing native pigs fed with T1 has a numerically higher value of 8.95 compared with T2 which is 7.99. For the FCR at 61-90 days, the growing native pigs fed with T2 recorded a numerically lower value of 10.45 compared with T1 which is 10.11. Jaya *et al*. (2008) indicated comparable feed conversion ratio of growing-finishing pigs was evident when *Trichantera* was used to replace the partial amount of commercial feeds in the diet.

The final live weight, sales value of pigs, cost of the diet and the mean feed profit of native pigs fed diets with or without TLM are presented in Table 4. Feeding growing native pigs with T2 resulted in numerically increasing income over feed cost associated with higher body weight and lower cost of feeds but was not statistically significant (P>0.05).

Incremental net benefit analysis showed that the growing native pigs fed with T2 were numerically increasing the income due to increased returns and the decrease in the cost of feeds.

Feeding growing native pigs with T2 recorded a Php 207.00 higher sale value than those fed with T1 which was associated with the numerically higher average final live weight. Growing native pigs fed with T2 used up more funds for feeds which is Php 4.86 higher than growing native pigs fed under T1. The results revealed that growing native pigs fed using T2 rations showed numerically higher income over feed cost at Php 202.14 higher than growing native pigs fed with T1 which made the feed cost lower and improved the income. However, income over feed cost did not differ significantly in all feeding periods ($P>0.05$). The advantage of *Trichantera* is that the leaves are readily available to be consumed by growing native pigs. The primary consideration of using forage in the feeding program for growing native pigs is to save on the cost of feed consumed.

In conclusion, the study was conducted to assess the response in terms of growth performance and to determine the economic benefits of *Trichantera* feeding in growing native pigs. Results showed significantly higher ADFI in T2 diet ($P<0.05$). With regards to growth performance, the BWG, ADG and FCR of growing native pigs in all feeding periods were found comparable. Economic benefit was not also achieved with dietary *Trichantera* inclusion. Considering that there was a significant difference in feed intake by growing native pigs fed diets with 15% *Trichantera*, higher inclusion for *Trichantera* may elicit a significant response in future studies.

Table 4. Income over feed cost of growing native pigs fed with *Trichantera* leaf meal as partial replacement to basal diet (Php).

Parameters	**T1 (100% BD)**	**T2 (85% BD + 15% LM)**	***P*-value**
Final Liveweight, kg	8.74 ± 0.54	10.12 ± 1.04	0.2738
Sale Value of Pigs, Php[1]	1,311 ± 80.74	1,518 ± 156.59	0.2738
Feed Cost, Php			
0-30 days	120.32 ± 9.56	118.25 ± 3.61	0.8444
31-60 days	133.68 ± 7.38	143.81 ± 11.89	0.4896
61-90 days	170.28 ± 10.64	167.09 ± 20.80	0.8944
Total Feed Cost, Php[2]	424.29 ± 20.69	429.15 ± 32.53	0.9027
IOFC, Php[3]	886.71 ± 62.07	1088.85 ± 126.78	0.1900

[1]Price per kg/live weight of pigs is Php 150.00.
[2]Total feed cost was calculated based on mean feed consumed multiplied by the price per kg of basal diet and *Trichantera* using the corresponding price per kg of feed.
[3]Income over feed cost was calculated as the difference between the sale value of pigs and the total feed cost.

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