



## ຜົນຂອງການໃຫ້ບອນ ແລະ ຕົ້ນກ້ວຍຕໍ່ການຈະເລີນເຕີບໂຕຂອງໝູພື້ນເມືອງລາວ

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ພາກວິຊາວິທະຍາສາດການລ້ຽງສັດ, ຄະນະກະເສດສາດ ແລະ ຊັບພະຍາກອນປ່າໄມ້, ມະຫາວິທະຍາໄລສຸພານຸວົງ

### ບົດຄັດຫຍໍ້

ການສຶກສາຄັ້ງນີ້ແມ່ນມີເປົ້າໝາຍ ເພື່ອພັດທະນາການນໍາໃຊ້ພືດທໍາມະຊາດ ເປັນອາຫານໝູພື້ນເມືອງລາວ ໂດຍມີຈຸດປະສົງ ເພື່ອສຶກສາການໃຊ້ ບອນໝັກ ແລະ ຕົ້ນກ້ວຍໝັກຮ່ວມກັບຮໍາ ເປັນອາຫານໝັກ ແລະ ໃຫ້ຊໍາເຫຼົ້າ ແລະ ເສດອາຫານຮ່ວມກັນຕໍ່ການກິນໄດ້ ແລະ ການຈະເລີນເຕີບໂຕຂອງໝູພື້ນເມືອງລາວ. ໝູຈໍານວນ 16 ໂຕ (ນໍ້າໜັກສະເລ່ຍ  $10.4 \pm 0.6$  ກິໂລກຼາມ/ໂຕ) ຈັດເຂົ້າແຜນການທົດລອງແບບສຸ່ມສົມບູນ ປະກອບ 4 ສິ່ງທົດລອງ ແຕ່ລະສິ່ງທົດລອງມີ 4 ຊໍາອາຫານຄື: ສິ່ງທົດລອງ 1 ໃຫ້ຮໍາ 50% + ເສດອາຫານ 50% (T1), ສິ່ງທົດລອງ 2 ໃຫ້ຕົ້ນກ້ວຍໝັກ 25% + ບອນໝັກ 25% + ຮໍາ 50% (T2), ສິ່ງທົດລອງ 3 ໃຫ້ບອນໝັກ 40% + ຮໍາ 40% + ສໍາເຫຼົ້າ 20% (T3) ແລະ ສິ່ງທົດລອງທີ 4 (T4) ໃຫ້ຕົ້ນກ້ວຍໝັກ 20% + ບອນໝັກ 20% + ຮໍາ 40% + ສໍາເຫຼົ້າ 20% ໄລຍະເວລາໃນການທົດລອງແມ່ນ 90 ວັນ. ຜົນການທົດລອງພົບວ່າອາຫານທົດລອງມີຜົນຕໍ່ປະສິດທິພາບການຈະເລີນເຕີບໂຕຂອງໝູໂດຍກິນອາຫານໄດ້ສະເລ່ຍຕໍ່ວັນ (ADFI) ແລະ ນໍ້າໜັກເພີ່ມສະເລ່ຍຕໍ່ວັນ (ADG) ຂອງ T1 ສູງກວ່າໝູ (p<0.001). ໃນທາງກົງກັນຂ້າມ ອັດຕາອາຫານຕໍ່ການເພີ່ມຂຶ້ນຂອງນໍ້າໜັກ ພົບວ່າຕໍ່ກວ່າໝູ ແມ່ນ T2 (p<0.017) ແລະ ຄວາມໜາຂອງໄຂມັນສັນຫຼັງສູງສຸດໃນ T1 (p<0.012). ຈາກການທົດລອງໃນຄັ້ງນີ້ສະຫຼຸບໄດ້ວ່າ ການໃຫ້ບອນໝັກ ແລະ ຕົ້ນກ້ວຍໝັກ ມີຜົນຕໍ່ປະສິດທິພາບການຈະເລີນເຕີບໂຕ ແລະ ໄຂມັນສັນຫຼັງ ຂອງໝູພື້ນເມືອງລາວ. ເຊິ່ງມັນຈະເປັນ ຂໍ້ມູນທີ່ເປັນປະໂຫຍດ ແລະ ສາມາດນໍາໄປໃຊ້ໄດ້ດີໃນການລ້ຽງໝູຂອງຊາວກະສິກອນໃນອານາຄົດ.

ຄໍາສໍາຄັນ: ບອນໝັກ, ຕົ້ນກ້ວຍໝັກ, ສໍາເຫຼົ້າ, ການຈະເລີນເຕີບໂຕ, ໝູພື້ນເມືອງລາວ

## The effect of taro and banana pseudo-stem (*Musa Aduminata*) silage with rice bran as basal diet on the growth performance of Lao native pigs

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### Abstract:

This study was designed to compare between the silages of taro and banana pseudo-stem on growth performance of Lao native pigs. Sixteen pigs (body weight =  $10.40 \pm 0.60$  kg) were allocated to four dietary treatments, with four pens per treatment and one pig per pen. Basal diets were rice bran 50% + 50 % food waste (T1), silage of banana pseudo-stem 25% + taro silage 25% + rice bran 50% (T2), taro silage 40% + rice bran 40% + 20% rice distiller by-product (T3), and silage of banana pseudo-stem 20% + taro silage 20% + rice bran 40% + 20% of distiller's by-product (T4) and fed for 90 days. Growth performance was affected by dietary treatments over the total experimental period. The values of average daily feed intake (ADFI) and average daily gain (ADG) in T1 was higher than other treatments (p<0.001). In contrast, lowest value of Feed/Gain was found in T2, (p<0.017). Highest fat thickness was also indicated in T1 (p<0.012). In conclusion, pig fed silages of taro and banana pseudo-stem has beneficial effects on the ADFI, ADG, Feed/Gain and fat thickness (p<0.05). To find the specific factors affecting pig growth performance, and sufficient nutrient intake in growing pig is critical concerns for future study.

**Keywords:** Banana pseudo-stem silage, taro silage, growth performance, Lao native pig.

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## 1. Introduction

Local pig production in Laos is almost 100% found in smallholder farms integrated with crop production in low input and low output production systems (ILRI 2002). However, feed for pig is based on rice bran, which is fed together with a small amount of green feed. Thus rice bran is available in most farm households. The main problem is the supply of protein as soybean and fish meals are not available in rural areas. Phengsavanh and Stür (2006) showed that growth rate was increased from 100 to 200 gram/day by providing some protein-rich forage in the form of stylosanthes. However, other forages appear to have more potential in pig diets based on rice bran.

Taro (*Colocasia esculenta*) is known as a food crop which provides high yield of roots (or corms) and foliage. Taro is a tropical feed crop that can be grown under flooded or upland conditions (Chhay et al., 2007). Its leaves are rich in protein and easy to ensile Taro can be grown under flooded and upland conditions (Buntha et al., 2008). A constraint to its use is the presence of calcium oxalate which forms crystals on the surface of the plant that cause irritation (itching) in the mouth and on the skin of pigs when it is eaten. Farmers traditionally cook the leaves and stems in order to overcome this problem (Buntha et al, 2008). However, cooking requires fuel and is time-consuming. Ensiling the taro foliage is a recent development that has proved to be effective in reducing the oxalate content (Du and Preston, 2008). Initially molasses was used in the ensiling of Taro leaves (Malavanh and Preston, 2006); however, the finding that the stem contained a high level of sugars led to the idea of ensiling the leaves and stem together (Rodríguez and Preston, 2009), obviating the need for additional molasses.

The banana tree is widely planted in the tropics and is easy to plant and grows well in large areas. The main product is fruit as food for human but also there are by-products especially the stems and leaves. The protein content of the leaf is higher than the stem (11.7 and 4.1% in dry matter) and crude fiber about 24.1 % and 23.4 % respectively. The smallholder farmers in the rural area of the Lao PDR use the by-products from banana trees to feed their pigs.

Another potential source of high quality protein in rural areas of Laos is the waste after distilling the alcohol derived by yeast fermentation of sticky rice. The waste is called “Kheelao” and is used as a wet feed for pigs.

Rice distillers’ by-product or “hem” is traditionally used by farmers in Vietnam and Laos. Luu et al. (2009) showed that the protein content ranged from 17 to 33% (mean of 23%) in dry matter (DM) and 28.2 % of crude protein. According to the report by of Taysayavong and Preston (2010) it had a well-balanced array of amino acids. Luu et al. (2003) reported that this product could completely replace the fish meal in the diet of growing and fattening pigs, with no loss of performance.

The objective of this research to investigate the effect of taro (*Colocasia esculenta*) and banana pseudo-stem (*Musa aduminata*) silage by combining with rice distiller’s by-product, as rice bran with food waste as feed intake and improve the growth performance of local pigs.

## 2. Materials and Methods

Sixteen local pigs with an initial body weight of  $10.4 \pm 0.6$  kg were allocated to 4 treatments (diets) with 4 replicates per treatment (4 pigs per treatment). The design was distributed randomly into 4 treatments according to a complete randomized design (CRD).

The pigs were housed in individual pens made from wood and provided with feeders and drinking nipples. The pigs were vaccinated against swine fever and swine pest. They were de-wormed at the start of the experiment.

### 2.1. Experimental design

- T1: rice bran 50% + 50 % food waste
- T2: silage of banana pseudo-stem and taro silage 25% + taro silage 25% + rice bran 50%
- T3: taro silage 40% + rice bran 40% + 20% of distiller’s by-product
- T4: silage of banana pseudo-stem 20% + taro silage 20% + rice bran 40% + 20 % of distiller’s by-product.

## 2.2. Feed preparation and feeding

The pigs were adapted to the experimental feeds at least two weeks before collection of data. Feed and nipple drinking water were fed *ad lib*.

Taro (leaves and stems) and banana pseudo-stem were chopped into small pieces (2-3 cm length) and exposed to sunlight for 6 hours to reduce the moisture to about 75%, prior to packing into a 50 liter plastic tank, stored for 14 days before being fed to the pigs. Rice bran was purchased from a rice miller. Rice distiller by-product was bought from alcohol producer at Ban Donmai nearly the Souphanouvong University.

## 2.3. Data collection and measurement

The local pigs were weighed every 14 days during the experiment which lasted 90 days. Individual feeds offered and residue was recorded daily to measure the average daily feed intake (ADFI), average daily gain (ADG) and feed/gain of pigs. At the end of study the pigs were killed for measure the back fat.

## 2.4. Chemical analysis

Feed sample analysis (Table 1) to dry matter (DM), crude protein (CP) and organic matter (OM) of feed by method of AOAC (1990).

## 2.5. Statistical analysis.

Data for weight gain, DMI, ADG, FCR and back fat thickness were analyzed using the general linear model (GLM) option of the ANOVA software of Minitab version14 (2000).

## 3. Results

### 3.1. Growth performance

Growth performance of pig was show in table 2. When comparisons among treatments was highest was ( $p < 0.001$ ) of the ADFI in T1 but were similar ( $p < 0.05$ ) between T3 and T4 and lowest in T2. Final body weight, ADG were highest in T1 ( $p < 0.001$ ), and similar between T3 and T4 and lowest in T2 ( $p < 0.001$ ). On the other hand, feed/gain was found that similar in T1, T3 and T4 that showed highest in T2 ( $p < 0.05$ ).

Table 1: Nutrient composition.

Ingredients	Nutrient value		
	DM	CP	OM
Rice bran	91.37	7.62	90.69
Rice distiller by-product	9.74	35.87	96.93
Taro silage	11.98	14.56	92.67
Banana pseudo stem silage	18.63	4.25	80.32
Food waste	19.23	14.5	71.69

DM= Dry matter, CP=Crude protein, OM= Organic matter.

### 3.2. Back fat thickness

The back fat thickness of the experimental pigs (Figure 1) that show higher ( $p < 0.05$ ) in T1 than the other diets, but it was similar between T4 and T3 and lower ( $p < 0.05$ ) in T2.

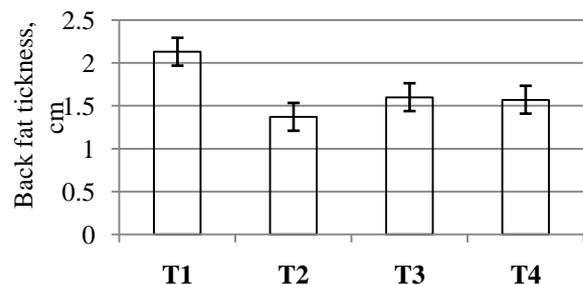


Figure 1: The effect of treatments on the back fat thickness.

## 4. Discussion

The ADFI (Table 2) when compare among treatments that show significant ( $P < 0.001$ ) was show highest in T1 but similar between T3 and T4 and Lowest in T2. However, it would be the food waste has most of rice loss in portion and rice distiller by-product is very palatable for pig so when used these ingredients combine with rice bran and taro silage was increased feed intake than using banana pseudo stem silage combine with rice bran relation to Luu et al. (2009) was reported the rice distiller by-product is very palatable of sow and fattening pigs in the farmer condition and Dao et al. (2013) reported ADFI decreased when the banana pseudo stem-taro silage replace rice bran of common duck. The result was show higher than Taysayavong and Preston (2010) was used the rice distiller by-product with rice bran when combine with water spinach in Mong Cai pig and local pig as well Manivanh and Preston (2011) that used taro silage with rice distiller by-product in cross-bred pig.

Table 2: Effect of taro and banana stem on growth performance of Lao native pig

Items	Treatments				SEM	P-value
	T1	T2	T3	T4		
Initial weight, kg	10.53	10.05	10.77	10.23	0.602	0.647
Final weight, kg	25.25 <sup>a</sup>	15.35 <sup>c</sup>	22.83 <sup>b</sup>	21.77 <sup>b</sup>	1.065	<0.001
ADG, g/d	175.30 <sup>a</sup>	63.10 <sup>c</sup>	143.45 <sup>b</sup>	136.01 <sup>b</sup>	11.866	<0.001
Feed/gain	8.65 <sup>a</sup>	12.40 <sup>b</sup>	8.77 <sup>a</sup>	8.71 <sup>a</sup>	0.816	0.017
ADFI, g/d	1,512.00	756.19	1,245.37	1,141.52	11.885	<0.001

<sup>a,b,c</sup> Mean with different superscript among treatments are significant different (p<0.001)

The ADG and feed/gain of this experiment were show in the table 2 highly significant (P<0.001) difference between treatments. However, ADG were highest in T1 but similarly between T3 and T4, moreover, it was lowest in T2. Nevertheless, Feed/gain were lowest in T2 it would be the reason of nutrition value on ingredient especially rice's distiller by-product, taro silage and food waste there were high protein content. However, these are ingredients compound could be improved on the growth rate. Therefore, the ADG of this study were lower than Taysayavong and Preston (2010), and Manivanh and Preston (2011) that report the diet had rice distiller by-product compound with taro silage and similar with the report from Phengvilaysouk et al. (2011) report in the local pig when diet had different level of fiber and protein.

## 5. Conclusion

In conclusion, pig fed silages of taro and banana pseudo-stem has beneficial effects on the ADFI, ADG, Feed/Gain and fat thickness (p < 0.05). To find the specific factors affecting pig performance, and sufficient nutrient intake for growing pig is critical concerns for future study.

## 6. Acknowledgment

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