Effect of Sweet Leaves (*Sauropus androgynus* L Merr) meal inclusion into basal feed on performance and IOFC of growing pigs

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Abstract. The study aimed at evaluating effect Sweet (*Sauropus androgynus* L. Merr) leaves meal (SLM) inclusion into feed on performance and Income over Feed Cost (IOFC) of growing pigs. There were 12 landrace crossbred barrows 4-5 months of age with 26.5-55.5kg (CV= 19.69%) initial bodyweight used in a feeding trial. Randomized block design 4 treatments with 3 replicate procedures were applied. The 4 treatment feeds offered in the feeding trial were: (1) T₀: 100% basal feed; (2) T₁: 97% basal feed + 3% SLM; (3) T₂: 94% basal feed + 6% SLM; and (4) T₃: 91% basal feed 9% SLM. Variables evaluated were performances (feed intake, weight gain, and feed conversion) and IOFC. Statistical analysis shows that the effect of including SLM into basal feed is not significant (P>0.05) on either performance or IOFC of the pigs. The conclusion is that including Sweet leaves meal inclusion into basal feed performs similar values with basal feed, and up to 9% tends to be higher in performances and IOFC in grower pigs.

1. Introduction

In modern intensive swine production, feed is the single most considerable expense in swine production as it represents between 60 and 80% of the total cost of pork production in modern capital-intensive systems and thus it is the main parts of qualified and commercial pig feeds are also human foods [1, 2]. Small or home scale pig framers’ access are limited to qualified feeds; consequently, using locally available feedstuffs is the typical way practiced without any account in pig's nutrient requirement and healthy fulfilment. This because farmers' capability is low -even limited-in utilizing and composing locally available feedstuffs resulting in limited feed choice for their pigs. Utilizing potential local available feedstuffs is an unavoidable alternative way in providing choices for small scale farmers to diminish their dependence on commercial feeds.

The way of using them is by including the local feeds into typical feed formulation or substituting component or whole basal feed as they should not be fed as a single feed. The local feeds should be known, locally available-no seasonal would be better-, safe to consume, potentially contain the nutrient. Those criterions determine the economic value/price of the feedstuffs then can influence the feed cost [2]. *Sauropus androgynus* or known as *katuk* in Indonesia (Figure 1) has leaf is commonly known as sweet leaf due to its suitable nutritional components (Table 1) and sweet taste of the leaves after cooking [3,4].
Figure 1. Katuk and its distribution in Southeast Asian countries [3,4]

Sweet leaf meal (SLM) had been used in feeding trials in broiler chickens [5], and found that an addition of 3% old SLM increased significantly daily gain and improved feed conversion of broilers; laying hens [6], and in vitro as a medical herbal [7]. It has also been reported that including 3% SLM into feeds increased feed intake of broilers [8]. Including SLM 3%, 6%, and 9% into basal feed improved daily gain and feed conversion of broilers [9]. Those reports showed that sweet leaf is reasonably used as an alternative feedstuff mainly for monogastic.

Table 1. Nutritional composition of katuk

| Composition | India | Thailand | Indonesia | Vietnam | Malaysia |
|-------------|-------|----------|-----------|---------|----------|
| Energy (kcal) | 28.00 | 40.04 | 317 | 401.04 | - | 100.05 |
| Moisture (%) | 69.09 | 88.00 | 85.04 | 89.05 | 89.09 | - | 86.09 | 79.04 |
| Protein (%) | 97.04 | 03.04 | 05.03 | 04.02 | 15.08 | 29.02 | - | 07.06 |
| Carbohydrate (%) | - | 00.05 | - | 03.09 | 54.05 | 0.00 | - | 06.09 |
| Fat (%) | 01.01 | 01.04 | 00.06 | 00.09 | 04.00 | 04.06 | - | 01.08 |
| Fibre (%) | 01.08 | 01.07 | 01.08 | 01.02 | 36.00 | 08.02 | - | 01.09 |
| Ash (%) | - | - | 05.03 | 01.04 | 12.09 | 12.01 | 01.04 | 02.00 |

The study was designed as an early trial for a pig in the semiarid area to include SLM in pig feed by adopting the levels used by [9] in the broiler, assuming that both animals are monogastric with the similar digestion system. The main objective of the study is to widen the alternative pig feeds selection for small/home pig farmers in the semiarid region.

2. Materials and methods

2.1. Experimental animals and feed treatments

There were 12 grower landrace crossbred barrows 4-5 months of age with 26.5-55.5 kg (Coefficient of Variation/CV = 19.69%) initial body weight used in the feeding trial. The pigs were fed in 2 m x 1.8 m individual pen of each. Basal feed was composed of: 30% cornmeal + 37% rice bran + 31% grower concentrate (KGP709) + 1.5% coconut oil + 0.5% mineral 10 to fulfil 18 – 19 % crude protein (CP), 3500-4000 Kcal gross energy (GE) and 7% crude fibre (CF) requirement [10]. The trial was designed based on 4 treatments with 3 blocks of the randomized block design procedure. The four treatment feeds were formulated as: (1) T0: 100% basal feed (control); (2) T1: 97% basal feed + 3% SLM; (3) T2: 94% basal feed + 6% SLM; and (4) T3: 91% basal feed 9% SLM. Diets with ingredients composition of experimental diets are presented in Table 3. Treatment feeds, and water was provided ad libitum during the feeding trial period.
Table 2. Nutrient composition of treatment feeds

| Content                          | T₀     | T₁     | T₂     | T₃     |
|----------------------------------|--------|--------|--------|--------|
| Dry matter (DM) (%)             | 90.13  | 90.07  | 90.02  | 89.96  |
| Organic matter (OM) (%)         | 83.79  | 83.28  | 82.76  | 82.25  |
| CP (%)                          | 17.54  | 17.89  | 18.24  | 18.58  |
| CF (%)                          | 7.12   | 7.16   | 7.18   | 7.23   |
| Fat (%)                         | 2.44   | 2.53   | 2.59   | 2.64   |
| Ca (%)                          | 1.58   | 1.59   | 1.61   | 1.62   |
| P (%)                           | 1.11   | 1.09   | 1.07   | 1.05   |
| GE (Kcal/kg)                    | 4338.96| 4279.68| 4296.04| 4312.89|

Note: approximate analysis of Feed Agricultural Polytechnic Laboratory Kupang, 2018. Analysis of Soil Chemical Laboratory of Agriculture, Faculty Nusa Cendana University Kupang, 2018.

2.2. SLM processing
SLM was processed by [9] procedure as follows:
- Fresh old sweet leaves separated from their stalk and stem were then air-dried at room temperate for 2-4 days until the leaves dry weight stable.
- Dried sweet leaves were ground using a manual grinder and filtered to separate the clean meal from their leaves bone. The clean meal was then used for trial feeds according to the levels stated.

2.3. Study variables
Variables evaluated in the study were: daily feed intake, daily weight gain (ADG), feed conversion, and Income over feed cost (IOFC). IOFC value was calculated from “the difference between the price of total weight gain (IDR) and total feed cost (IDR) spent during feeding trial” (Modifying: [11]).

2.4. Data analysis
Data were analysed using Analysis of variance (ANOVA) and Duncan’s multiple range test [12].

3. Results and discussion
3.1. Feed intake, average daily gain (ADG), feed conversion (FC) and IOFC
Data on feed intake (FI), average daily gain (ADG), feed conversion, and IOFC resulted in the trial are shown in Table 4.

Table 3. Feed intake (FI), average daily gain (ADG), feed conversion ratio (FC) and IOFC of pigs

| Variable | T₀               | T₁               | T₂               | T₃               | P-value |
|----------|------------------|------------------|------------------|------------------|---------|
| FI (g)   | 3452.78±1104.0   | 3461.11±825.06   | 3470.83±386.11   | 3608.33±114.56   | 0.09    |
| ADG (g)  | 793.65±244.36    | 809.52±123.72    | 817.46±76.54     | 916.67±31.50     | 0.17    |
| FC(FI/ADG)| 4.37±0.37       | 4.28±0.07        | 4.26±0.19        | 3.97±0.59        | 0.15    |
| IOFC (IDR)| 498423.5±118426.7| 553854.0±47532.2 | 492506.3±53548.3 | 593195.4±86057.5 | 0.059027778 |

Note: P values indicate no significant differences (P>0.5) among treatments of all variables evaluated.

3.2. Nutrient content of the Trial feed
Table 1 shows that CP, fat, and SK contents of trial feeds increased as the SLM, including levels increased. This is reasonable because SLM contributed 28.68% (CP), 4.2% (fat), and 12.02% (CF), as reported by [13] that are higher than those contents in substituted basal feed parts.
3.3. Feed intake, average daily gain (ADG), feed conversion (FC) and IOFC

Table 2 shows that average daily feed intake empirically tends to increase either not significantly (P>0.05) as the SLM, including levels increased into basal feed, or there is not any significant difference (P = 0.09) among treatment averages. This can be assumed that SLM supplied a little better taste to improve basal feed palatability resulting in a few increasing in voluntary feed intake of pigs [14]. It may because SLM is tasteless, and no aromatic resulted in merely air-dried processing- dry frying would be suggested to improve sweet leaves taste and aroma [15]. This figure is slightly lower compared to result by [2] using fermented frying dried tamarind seeds meal from early-stage pregnancy sows. Difference plant parts (leaf vs. seed), processing method (air-drying vs. fry drying), body size and life stage of pigs are assumed to be the influencing factors.

3.4. Average daily weight gain (ADG)

Table 3 showed that the ADG figure is linear with the daily feed intake figure. The figure shows that empirically, ADG improved slightly not significantly (P>0.05) as the level of SLM increased in the basal feed or the more the basal feed was substituted by SLM meal in the trial feed. In addition, none significant differences (P = 0.17) among treatment averages. This describes that there were small additional feeds consumed supplied a few additional nutrients content by substitution, followed with low utilized by a pig. Small additional nutrients and may be followed with low nutrient utilization efficiency [16] by pigs were also assumed as such factors influencing this figure. Plant parts and species [17] feed concentrate could the suspected influencing factors.

3.5. Feed conversion

Average feed conversion (FC) presented in Table 3 showed that numerically increasing SLM, including levels, tend to reduce not significant (P>0.05) FC value. Also, Duncan's test found that there are no significant differences (P = 0.15) among treatment averages. Increasing SLM, including levels into basal feed, improved slightly (0.09-1.6) feed efficiency utilization by pigs. The pigs need 3.97-4.37 feed units to perform 1 unit weight gain, which means only 23-25% trial feeds could be converted into weight gain by the pigs during the feeding trial period. Efficiency value (EV: 25%) result of this study is lower compared to [18] finding (FC 3.5 = EV 29%). The difference in protein quality of the two trial feeds could be such factor causing the difference between these results. The inclusion of 33% Sierad concentrate feed (KGP709), which 2% is higher than in this study, might contribute slightly higher protein quality compared to in this study. It because protein quality plays a large role in muscle growth [19], for it composes 26% of fresh dry or 89% dry weight pork [19].

3.6. Income over feed cost

Data in Table 3 figured out that IOFC value increased either not linear or not significant (P>0.05) as the SLM, including levels increased in the basal feed. IOFC figure, however, is almost at the linear line with feed intake, ADG, and FC figures because it shows that the value at level 6% is lower, which means that it increased linearly. This is caused by individual cases, as there were 2 (one from block II and one from block III) pigs at this level performed IOFC value lower than other levels. This resulted in a low contribution to the average value for these levels. Statistically, there were no significant differences (P = 0.85) among treatment averages. It means that neither non-linear increasing IOFC nor lower the values at level 6% contributed significant values to statistically differences among treatments. As it is shown in Table 4, the range of IOFC value was 492506.3 - 593195.4 or 534,494.8 on average, as the difference between income from the gain of pig and cost spent for feeds during the feeding trial. This means that there were IDR 534,494.8 profit-as gross profit for not all costs were included- obtained from gain per pig after 2 months feeding trial. This profit is slightly higher than the finding of [20] among pig farmers in the Minahasa Regency.
4. Conclusions and recommendations

4.1. Conclusions

a. Including 3-9% Sweet leaves meal into basal feed performs the similar results with basal feed-in performances (feed intake, average body weight, feed conversion) and income over feed cost (IOFC) value of grower pigs.
b. An increasing level of Sweet leaves meal up to 9% into basal feed tends to increase performance and IOFC value of grower pigs.

4.2. Recommendations

a. Sweet leaves meal can be used as a feed component of pig basal feed formulation.
b. Further study can recommend increasing the inclusion of Sweet leaves meal into basal pig feed.

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