Effect Agricultural and Food Industry by Product on Pig Peformance

by Trisiwi Widayati

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Effect of Agricultural and Food Industry Byproducts on Pig Performance

Trisiwi W Widayati, Rahayu BWW, Raharjo DJ

Faculty of Animal Science, Papua University, Jl.Gunung Salju, Manokwari 98314, Indonesia
t.widayati@unipa.ac.id

ABSTRACT

The aim of this study was to analyze the potency of agricultural and food industry byproducts on pigs performance. The agricultural and food industry byproducts were collected from two traditional markets, five restaurants and fifteen small-scale food industries. The four treatments were Ration I: Combination of 75% agricultural and food industry byproducts and 25% commercial ration; Ration II: Combination of 50% agricultural and food industry byproducts and 50% commercial ration; Ration III: Combination of 25% agricultural and food industry byproducts and 75% commercial ration; Ration IV: 100% commercial ration. Rations I, II, and III were formulated based on dry matter basis with isoprotein and isoenergy concept. ADG, feed consumption and FCR were measured to determine the pig performance. Tabulation was used to analyse the data. The result of the research showed that there was no significant difference among treatments. It means that the use of agricultural and food industries' wastes as the alternative components of pigs' feed to substitute the commercial ration did not reduce pigs' performance and production.

Key Words: Agricultural Byproduct, Pig, Ration

INTRODUCTION

The paradigm of modern animal husbandry is based on zero waste concept. Use of agricultural and food industrial byproducts into useful materials is an important issue that needs to be done. Pigs are the favorite animal for the Papuan people because they are valuable in social, cultural and economic setting. Most of the community use pigs in traditional ceremonies, and also as an exchange tool in several transactions. The market demand of this commodity is quite high and it has become a primary saving for many farmers. The selling price of this animal is sufficiently high, ones in weaning period can be sold from IDR 1.000.000 to 1.500.000 ($69 to $103.5) and the price for ones aged 8-12 months varied from IDR 3.000.000 to 5.000.000 ($207 to $345). So far, pigs in Papua haven't been intensively raised yet. The animals usually are left to look for food by themselves, so the aspects of feeding, reproduction and health are not properly cared. In general, farmers feed their animal with only a single type of feed, such as tubers or roots which is low in quality. The minimum amount and the low quality of feed are factors that affect the slow growth of pig and make them more vulnerable to diseases (Iyai *et al*. 2011; Harikumar *et al*. 2016,). Another problem in raising pigs is, they are a monogastrict animal which many of their feed competed with human's food. This condition causes a problem in feed availibility during intensive pig raising, thus it is imperative to find alternatives to high quality pigs' feed without competing with the people (Woyengo *et al.* 2014; Schader *et al*. 2015).

A good livestock development depends on the availability of feed, socio-cultural conditions and local climate (Jabbar & Akter 2008; and Babovic *et al.* 2011). In fact,

the potential market of pig is high, but on the other hand there are still problems in the continuous feed, whether it is avalability, quality or cost. Thus it is necessary to use the ingredients from agriculture and food industry byproducts as an alternative of pig ration (Kasapidou *et al.* 2015; Katsoulis *et al.* 2016).

MATERIAL AND METHODS

Animal, ration and experimental design

Twelve male local pigs with an initial body weight of 12.54±1.84 kg were arranged in a completely randomized design with 4 treatments and 3 replications. The animal were housed in twelve individual cages.

Ration used in this experiment were formulated from agricultural and food industry byproducts i.e. fish waste, soybean curd waste, taro skin, soybean skin, vegetables waste, and commercial pig ration. The agricultural and food industry byproducts were collected from two traditional markets, five restaurants, and 15 food industries in Manokwari Regency. The four treatments were Ration I: Combination of 75% agricultural and food industry byproducts and 25% commercial ration; Ration II: Combination of 50% agricultural and food industry by-products and 50% commercial ration; Ration III: Combination of 25% agricultural and food industry byproducts and 75% commercial ration; Ration IV: 100% commercial ration. Rations I, II, and III were formulated based on dry matter basis with isoprotein and isoenergy concept. The commercial pig ration (CP 515) used in this experiment was produced by Charoen Pokphand, Indonesia. Formulation of pig ration in starter period is presented in Table 1.

Table 1. The potential and nutrients content of ingredients in pig ration

Ingredients	Nutrients content			
	DM (%)	CP (%)[1]	GE (kcal/kg)[1]	ME (kcal/kg)[2]
Fish waste	29.41	31.21	3,432.94	2,709
Soybean curd	14.31	23.85	4,950.57	3,906
Soybean skin	15.96	15.10	4,022.23	3,174
Taro skin	26.45	4.26	3,648.96	2,879
Vegetables waste	9.84	15.80	3,683.99	2,907
Waste of restaurant	35.84	13.72	4,202.00	3,315
Commercial pig ration (CP 511)	87.00	19.50	-	3,315.12

[1]Dry matter basis; [2]Based on calculation

Experimental procedure

The experiment lasted for 35 days and was comprised of 10 days for ration adaptation, followed by 25 days for feed intake data collection. The rations was offered twice a day (at 08:00 and 16:00 h) *ad libitum*. Fresh water was available *ad libitum*. Individual ration refusals, if any, were

collected, weighed daily and samples were collected for analysis. Before the start of the experiment, pigs were dewormed with 0.7 ml/kg BW of Albendazole (PT Kimia Farma, Indonesia). The animals were weighed each week throughout of the experiment.

Statistical analysis

Data were subjected to analysis of variance for a completely randomized design using SPSS version 21. Comparison of means was carried out using the Duncan's multiple range tests, when the effect of treatment was significant ($P<0.05$). The linear model of experimental design as follows:

$$Yij: \mu + Ti + \varepsilon ij$$

Yij : The score for observation of ith variable and jth replication
μ : The overall population mean
Ti : The effect of ith treatment level (type of ration)
εij : The error effect associated with ith treatment level and jth replication.
i : 1, 2, 3, 4
j : 1, 2, 3

RESULTS AND DISCUSSION

Agricultural and food industry wastes in Manokwari Regency are commonly found in the markets and food industries center. Agricultural wastes are mostly vegetables, with water spinach as the dominant commodity. Vegetable wastes are the parts which aren't used for human consumption, such as the stem and root, or the ones that has already rotten or not sold. Aside from vegetable wastes, there is also fish waste which is free. Other wastes include ones from tofu industry, taro chips industry, and lastly from restaurants. To this date, those wastes haven't been utilized and usually just thrown away. The most important factor in livestock's ration formulation is the balance between energy and protein composition. That is why proximate analysis was conducted, as shown in Table 1.

Waste utilizations as shown in Table 2 were adjusted to gross protein and energy requirements for starter-pigs' metabolism which were 19.5% and 3150 kcal/kg. The feed used were vegetable waste, fish waste, tofu waste, taro skin, and wastes from restaurants. The reason for the utilization of those wastes was they were easily obtained in Manokwari. Two kinds of ingredients which were fish waste and tofu waste used in this study were included as protein sources, while others such as vegetable waste, restaurants' waste, and taro skin were used as the energy sources. Taro skin had the lowest CP content (4.26%), otherwise the highest CP content obtained was from fish waste (31.21%). Tofu waste wase the leftovers from the tofu-making process, and weighed around 25-35% of the final tofu product. The tofu waste used in this study had 23.85% CP content, this was consistent with the statement from Mathius dan Sinurat (2001) that tofu waste could be utilized as protein source feed since they had high gross protein value, around 23-29%. The commercial feed (CP 511) was used in this study as the control.

Table 2. The composition of pig rations (%) in starter period

Feedstuffs	Ration I	Ration II	Ration III	Ration IV
Fish waste	18.57	12.37	6.17	-
Tofu waste	15.70	10.47	5.23	-
Taro skin	8.82	5.90	2.94	-
Vegetables waste	16.04	10.69	5.37	-
Restaurant waste	15.87	10.57	5.29	-
Commercial ration*	25	50	75	100
Total	100	100	100	100

*Contained corn, rice bran, soybean meal, coconut meal, meat and bone meal, wheat meal, canola, calcium, phosphorus, vitamin, trace mineral, and anti oxidant

Three kinds of treatments were made from wastes, while the last one was commercial feed as the control. Tabulation and statistic tests results of agricultural waste usage as starter pigs' feed are presented in Table 3.

Table 3. Analysis result of RAL statistic for ADG, feed intake and feed conversion

Variables	Treatments				P-value	Sig.
	P1	P2	P3	P4		
Average daily gain (kg/head/day)	0.444±0.01	0.445±0.03	0.465±0.05	0.457±0.02	0.791	ns
Feed intake (kg/head/day)	1.054±0.01	1.004±0.05	1.042±0.04	1.002±0.05	0.353	ns
Feed conversion ratio	2.375±0.06	2.259±0.09	2.250±0.13	2.193±0.02	0.159	ns

Ns: Non-significant

Growth is defined as the interaction between genetic, food, and the environment (Hardjosubroto 1994). Livestocks' growth as the result of efficient maintenance could be measured by feed intake, body-weight gain, and the feed conversion ratio (Devi *et al.* 2014 and Rocadembosch *et al.* 2016). The result indicated that the utilization of all four kinds of ration was able to increase the pigs' daily weight gain, with the highest average from ration III (0.465±0.05 kg daily) followed by ration IV, II, and I.

In feed intake aspect, the highest intake found in pigs fed with ration I, followed by ration II, III, and IV (Table 3). This could be due to relatively higher palatability of agricultural and food industry wastes. Feed contained complete ingredients were more liked by the pigs. This agrees with previously studied by Wea (2017) that increasing use of market wastes such as water spinach, fish waste, and chaff as a mixture for pigs' ration caused higher the feed intake.

Feed conversion ratio is the amount of feed which needed to be consumed to gain 1 kg of body weight. The lower the value, the higher the efficiency of the feed to increase the livestocks' body weight. The best feed conversion rate were ration IV (100% commercial feed), followed by ration III, II, and I. This agrees with Behnke's (1998) cited by Briggs *et al.* (1999) that feed in the form of pellets had high

digestibility, because they need less energy to be digested. Therefore, to improve pigs' ability to digest feed made from agricultural and food industry wastes in the future, it is necessary to consider the production process, to determine which kind of size or form that is easier to digest.

Statistical test showed that there was no significant difference between treatments, whether it was ration I, II, or III against ration IV (the control) for the pigs' performance, which were denoted by daily weight gain, feed intake, and feed conversion.

In the farm business, the feeding part is the most expensive of all the operational cost. A study conducted by Sala & Delia (2012) indicated that the feeding part covered 80% of the livestock production cost. In the previous study of Warouw *et al.* (2014) and Kueain *et al.* (2017) showed that proportion of feeding cost approximately 44.66 to 55% of total production cost. Such high percentage could be reduced by finding alternative source of feed, which without reduce the output quality.

CONCLUSION

Results of this study showed that there were no significant difference on pig performances. Feeding ration with the combination of 25% waste and 75% commercial feed had the highest FCR.

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