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C O N T E N T

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THE EFFECT OF SWEET POTATO (*IPOMOEA BATATAS* L.) TUBER AND LEAVES *BRANGKASAN* SUBSTITUTION IN THE GROWTH PHASE LANDRACE BALI PIG (3-6 MONTHS AGE) RATION

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Abstract

The high price of feed/ration is the biggest problem for farmers, so it requires a way to find quality but cheap feed ingredients, for example using brangkasan/*stucker, which are sweet potato leaves and twigs and tubers as feed ingredients substitution for pigs, the protein and energy content is still quite high, but the economic value has not been realized by the farmers. This study aims to determine the effect of some percentage tubers and sweet potato* brangkasan/*stucker to substitute the concentrate, on the performance of landrace Bali pigs. The study used a Completely Randomized Design method (CRD) with 4 treatments consisting of : T-1 30% concentrate + 60% pollard + 10% sweet potato* brangkasan/*stucker as control, T-2: 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% sweet potato leaves* brangkasan/*stucker, T-3:10% concentrate + 50% pollard + 30% sweet potato tuber + 10% sweet potato leaves* brangkasan/*stucker and T-4:10% concentrate + 40% pollard + 40% tuber +10% sweet potato leaves* brangkasan/*stucker, which are repeated 5 times. Based on the results of the study, T-2 (giving 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% sweet potato leaves* brangkasan/*stucker) causing an increase in body weight gain, final body weight and feed consumption, but decrease the feed conversion. Thus, it can be concluded that the substitution of sweet potato tubers and leaves* brangkasan/*stucker can be used as feed for growth phase landrace Bali pig.*

Key words**:** *landrace Bali pig, sweet potato tuber and leaves* brangkasan/*stucker*

INTRODUCTION

In line with the increasing population and public awareness of the nutritional benefits of growth, the need for meat is also increase to fulfil community nutrition. This can be seen from the amount of meat consumption which has increased to 10.06 Kg per capita per year, and the production of livestock meat other than beef/buffalo, including pork in 2017 was 2,770,890 tons, decreased 0.92% compared to 2016, although in the last five years it increased by 4.50% [1]. To meet the needs of the community for animal protein from meat, it is necessary to increase meat production, to meet the needs of animal protein is to intensify pigs farming. Estimation output of Bali landrace pig, are between 45.5-70.49% [9].

Indonesia has a number of native pigs breed, such as the Bali, Nias, Papua and the Sumba pigs, which are kept by farmers in their original place. The government shows its concern to develop this original pigs research to find out the characteristics of native pigs and their possible contribution to produce with simple maintenance system [7].

Indonesia is the country that has the largest pig germplasm in the world, which is five out of eight species, but the native population is decreasing [8]. The meat colour and cooking loss of landrace Bali pig as variables, more better than the landrace Bali pig crossing [10]. Pigs, especially landrace Bali pigs, are very suitable to be developed in Bali because almost every family, especially in rural areas, raising pigs is only a side business, whose function is to use food scraps while providing

additional income for the family. Pig raising in Bali, especially in rural areas, has an important role to increase family income, and plays an important role in traditional and religious ceremonies [5]. Natural increase landrace Bali pig more better than Bali pig crossing [9].

Brangkasan/stucker, are leaves, stems and tubers of sweet potatoes, which are used as feed for pigs, because the protein and energy content is still quite high but the economic value has not been realized by farmers.

Sweet potato (*Ipomoea batatas* L.) have an important role as human food [6]. Sweet potato (*Ipomoea batatas* L.) have main nutritional material in tuber are carbohydrates (starches), proteins, fats and vitamins that are soluble in fat [4]. Sweet potato (*Ipomoea batatas* L.) are important carbohydrate-producing plants and also can be used as feed ingredients for livestock. The protein content of leaves is much higher than in the tuber, thus sweet potatoes leaves are very good as animal feed, and are one of the forages that can be given to pigs. This is because the crude fibre content in sweet potato leaves is relatively low at 17.3% [2]. The sweet potato tuber are rich in protein, also which cultivated in Poland [3]. It has a high nutritional values, about 50% higher than the potato. Furthermore, it is said that the protein content of the fresh matter tuber, is 1.35g $100g^{-1}$.

Tubers are main usable part of the sweet potato, although leaves can also be used. The leaves is 20.2% protein with a digestibility of 80.2%. Sweet potato are a good and inexpensive energy source because they contain high carbohydrates around 25-35 grams. Therefore, the use of non-economical tubers as pig feed can be used as feed ingredients, because energy is the main requirement for livestock to grow and develop. The biggest component of a ration is energy and for pigs by 70%. The ration in pigs is expected to have 16% protein content, and 12% fibre content with daily consumption of ration 0.9 to 2.0 Kg. Along with the increasingly concentrate as high quality of feed, it is endeavoured to find other foods that are easily obtained at lower prices. Sweet potato (*Ipomoea batatas* L.) are important carbohydrate-producing plants and can be used as feed ingredients for livestock. Therefore, this study was conducted to examine the effect of sweet potatoes *brangkasan*/stucker tubers and leaves substitute in the rations on final body weight of growth stage landrace pigs with ages between 3-6 months.

MATERIALS AND METHODS

Materials

This research used 12 female 3-month-old landrace Bali pigs with body weight range between 11.5 Kg - 13.5 Kg, purchased from farmers in the village of Tejakula-Buleleng. The cage used was 4 (four) pieces sized 3x2 x1 meter, and each cage consists of 3 bulkheads and each bulkhead is filled with one pig. The study lasted for 3 months, and feed was given morning and evening.

Methods

This research use a Completely Randomized Design (CRD) with four treatments and five replications, consisting of:

a. T-1: 30% concentrate + 60% pollard + 10% sweet potato *brangkasan/*stucker as control

b. T-2: 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/stucker,

c. T-3: 10% concentrate + 50% pollard + 30% sweet potato tuber + 10% leaves *brangkasan*/stucker,

d. T-4: 10% concentrate + 40% pollard + 40% sweet potato tuber + 10% leaves *brangkasan*/stucker.

The research variables studied initial body weight, weight gain, final body weight, feed consumption, and feed conversion.

The research was carried out at Central Laboratory, Department of Animal Sciences, Faculty of Agriculture, Universitas Warmadewa.

Statistical Analysis

The study was carried out experimentally, used a Completely Randomized Design (CRD) of unidirectional patterns, with four treatments and five replications, consisting of:

a. T-1: 30% concentrate + 60% pollard + 10% sweet potato *brangkasan/*stucker as control

b. T-2: 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/stucker,
c. T-3: 10% concentrate + 50% pollard + 30% sweet potato tuber + 10% leaves *brangkasan*/stucker,
d. T-4: 10% concentrate + 40% pollard + 40% sweet potato tuber + 10% leaves *brangkasan*/stucker.

The data obtained were then analyzed by variance, and if there were significant differences (P<0.05) between treatments, followed by the Least Significant Difference (LSD) (SPSS-21 software package) is carried out.

RESULTS AND DISCUSSIONS

Initial body weight, weight gain, final body weight

Based on the results of the study, obtained from initial body weight, weight gain, final body weight, as listed in Table 1.

Table 1. The Effect of giving *brangkasan*/stucker sweet potato tuber and leaves on Initial Body Weight, Weight Gain, and Final Body Weight

Variables	Treatments (Kg/head)				
	T-1	T-2	T-3	T-4	SEM[2]
Initial Body Weight	12.67[a]	12.67[a]	12.67[a]	12.67[a]	4.98
Body Weight Gain	43.93[a]	45.16[b]	35.83[c]	25.16[d]	8.89
Final Body Weight	56.60[a]	57.83[a]	48.50[b]	37.83[c]	4.98

Source: Own results in the laboratory.
Notes: 1. SEM: Standard Error of the treatment means
2. Values with the same letters on the same line show no significant difference (P> 0.05)
3. Different letters on the same line show significant differences (P <0.01)

Table 1 shows that the use of 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/stucker (T-2) on body weight gain was higher than T-1 (control), significantly different (P<0.01), because feed with the content of complex food substances will produce faster growth compared to ration which is reduced by one of its important substances. This is in accordance with the statement of Anggorodi (1979) which states that the growth of livestock by the amount of food eaten, where the more the amount of food consumed, the higher the growth of livestock produced. Then T-3 and T-4 was lower than T-1 and T-2, very significantly different (P<0.01). This was due to the treatment that the sample was fed with lots of brangkasan/*stucker* sweet potato, consumed more crude fibre. An increase in the crude fibre content in the ration can reduce the metabolic energy (ME). High levels of crude fibre can cause disruption of other substances digestion. In Figure 1 which shows the effect of giving tubers and leaves *brangkasan* sweet potatoes (*Ipomoea batatas* L) to the body weight gain of landrace Bali pig.

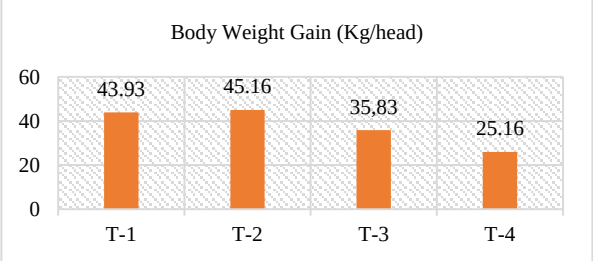

Fig. 1. The landrace Bali pig weight gain in several treatments.
Source: Own results in the laboratory.

The final body weight of the T-1 treatment was lower when compared to the T-2 but was not significantly different (P> 0.05); because T-2 had a low metabolic energy content, unless the material has a good energy source such as starch or carbohydrates. While T-3 and T-4 was lower than T-2, which was significantly different (P<0.01); because it has the same amount of energy and protein content but different coarse fibres will affect the amount of rations consumed. The low final body weight in T-3 and T-4, because the crude fibre content in the ration is too high which causes the chance of absorption of food substances decreases. Increased crude fibre in the ration, the consumption of feed increases, which will cause energy production to decrease.

Figure 2 shows the effect of giving sweet potato (*Ipomoea batatas* L) tuber and leaves *brangkasan* /stucker towards final weight of landrace Bali pigs.

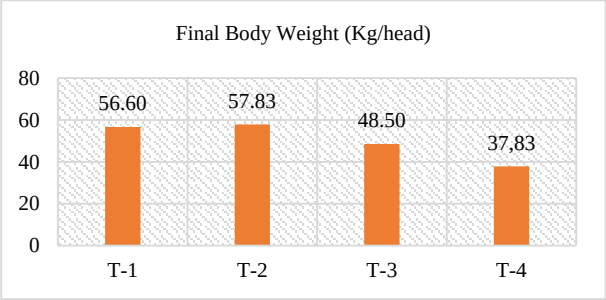

Fig.2. The effect of giving tuber and sweet potato *brangkasan*/stucker (*Ipomoea batatas* L) towards final weight of landrace Bali pigs.
Source: Own results in the laboratory.

From Figure 2, T-2 has higher final body weight, compared to other treatment, because T-2 has low metabolic energy content.

Feed Consumption and Feed Conversion

In Table 2, one may see the results for Feed Consumption and Feed Conversion

Table 2. The Averages data of Feed Consumption and Feed Conversion

Variables	Treatments				
	T-1	T-2	T-3	T-4	SEM
Feed Consumption (Kg/head)	122.50[a]	120.42[a]	111.00[b]	102.08[c]	4.40
Feed Conversion Ratio (FCR)	2.81[a]	2.68[a]	3.14[a]	3.95[a]	1.85

Source: Own results in the laboratory.
Notes:
1. SEM: Standard Error of The Treatment Means
2.Values with the same letters on the same line show no significant difference (P>0.05)
3.Different letters on the same line show significant differences (P<0.01)

Table 2 shows that the ration consumption in treatment T-1 is higher than treatment T-2 but statistically is not significant different (P> 0.05). This is because in treatment T-2 gets rations with higher energy and protein content (low crude fibre) so will growth faster, and the ration consumption lesser if rations are consumed with good metabolize energy. Energy and protein consumed are related to the tissue formed. Whereas in treatment T-3 and T-4 lower than T-2, was statistically very significantly different (P<0.01); because the food consumed has the same energy and protein content, but it has different feed crude fibre content, so it is clear that the consumption of rations in T-2 treatment is higher than the treatment of T-3 and T-4 treatments, because the increase in crude fibre content in T-3 and T-4 treatments, can reduce digestibility. In addition, the increase in crude fibre content in the ration can lead more efficient use of metabolic energy caused by transferring the portion of the net fraction of muscle energy needed to push the remaining food along the digestive tract.

Figure 3 shows the effect of giving tubers and leaves *brangkasan*/stucker propagate to feed consumption in landrace Bali pigs.

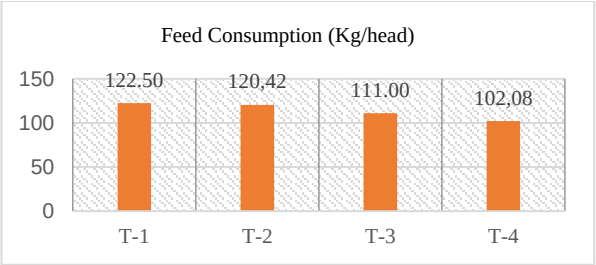

Fig. 3. Feed Consumption of landrace Bali pig in various treatments
Source: Own results in the laboratory.

T-2, T-3 and T-4 were lesser consumed by the pig, compared to T-1. Even the consumption were less but the growth of the pig was not significant different with T-1.

Feed conversion

Feed conversion is one indicator that can provide an illustration of the level of efficiency of ration used, the lower the ration conversion value, the better the efficiency of the ration used. T-2 (10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/stucker) gave the best feed conversion.

Although the FCR produced was not significantly different (P> 0.05), there was a tendency for pigs that received T-2 treatment, which had the ability to more efficiently convert food ingredients into meat or in other words the amount the food needed to increase one-unit weight is smaller than that of pigs giving the treatment T-1.

In the treatment of T-3 and T-4 the ration conversion was low so that body weight gain was also low as a result of the pigs being inefficient in utilizing rations which caused low ration conversion. An increase in crude fibre content in the ration causes the

opportunity to absorb food substances for growth to decline.

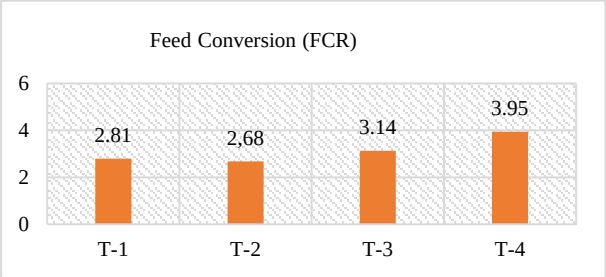

Fig. 4. Feed Conversion on landrace Bali pig for each treatment
Source: Own results in the laboratory.

Then it is presented in Figure 4 about the effect of giving tuber and leaves sweet potato *brangkasan*/stucker to the conversion of landrace Bali pig rations. The T-2 gave the best feed conversion for growth phase landrace Bali pig, that giving tuber and leaves sweet potato *brangkasan*/stucker.

CONCLUSIONS

From the results of the study, it can be concluded that giving 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/ stucker, can increase weight gain, final body weight, and ration conversion but decrease the ration consumption compared to the control ration. It means that giving *brangkasan*/stucker tuber and leaves sweet potatoes (*Ipomoea batatas* L) as the concentrate substitution, can be used to growth phase landrace Bali pig ration.

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