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Performance of Balinese Pigs Feed Traditional and Fermented Feed in Sukanadi Farmer Women's Group

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A B S T R A C T

A study was conducted from April 30, 2023 to June 29, 2023 at the Sukanadi Women Farmers Group (KWT) in Pejarakan Village, Gerokgak Subdistrict, Buleleng Regency, which aimed to determine the performance of Balinese/local pigs treated with traditional feed and fermented feed. This study will test the treatment of feed without fermentation (traditional = T) with fermented feed (F). The feed ingredients used are 70% banana stalks, 20% lamtoro leaves and 10% complete feed (mixture of 25% rice bran, 50% corn flour and 25% concentrate). Each treatment used 5 Balinese/local pigs of weaning age ± 2 months with a weight range of 8-10 kg. The variables observed were initial body weight, body weight gain, ration consumption, final body weight, and ration conversion. Furthermore, the data obtained were analyzed by t-test (paired test) according to Steel and Torrie (1991). Based on the results of the study, it was found that female Balinese/local pigs given fermented feed showed better performance than those given traditional feed. Thus it can be concluded that fermented feed can be applied by the community because it is more effective and efficient with feed formulations consisting of 70% banana stems, 20% lamtoro leaves, and 10% complete feed

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INTRODUCTION

Pig farming in Bali still occupies an important position in rural communities. Pigs are one of the livestock commodities that have been kept for a long time by the community. The pig farming business in Bali is mostly traditional farms that raise pigs on a small/household scale between 2-3 heads. Many traditional farmers in rural areas still choose Balinese pigs to raise because they are very suitable for Balinese housewives as piggy banks or "tatakan banyu" because with simple feeding and utilization of kitchen waste (banyu and so on), Balinese pigs are able to provide weight gain even though it is not optimal. In addition, Balinese pigs are still widely kept in rural areas because they have a very important socio-cultural status. Many ceremonial activities and upakara materials use pork such as " babi guling". In addition to meeting the needs for religious ceremonies, pork is also used in various social activities.

Along with the increasing market demand must be balanced with efforts to improve the productivity and appearance of Balinese pigs, especially in terms of weight gain, quality and quantity of feed because local pig farms in Bali still rely on local agricultural waste and forage in the vicinity as the main feed. Farmers are less able to buy commercial feed because it is very expensive. The most important agricultural wastes given are banana stalks and rice bran, while the forage given is in accordance with the potential produced such as cassava leaf waste, cassava leaves, taro leaves, peanut leaves, Moringa leaves. Usually these materials are mixed and then given in fresh form and some are boiled. This is in accordance with the results of research by Yan Tonga, et al. (2021) that traditional feed for Balinese pigs in Gerokgak District is in the form of banana stems, cassava leaves/kelor/lamtoro/keladi and rice/corn bran which are mixed and then given after boiling. This traditional feeding shows that the final body weight of local pigs aged 6 months is still below the standard, this is likely due to the quality of the feed not meeting the needs for the growth of these pigs.

One of the efforts to improve the quality of feed is by fermenting the feed ingredients because through the fermentation process there will be an increase in crude protein and a decrease in crude fiber (digestibility value increases), so that the feed is more absorbed for livestock growth. This fermented feed can be more effective and efficient because the effectiveness of feed is highly dependent on feed digestibility which directly affects efficiency (Patience, *et.al*., 2015).

Fermented feed is also more efficient because it is easier to provide than traditional boiled feed. Fermented feed does not need to be made every day, there is no need to find firewood and boil the feed. This is felt by Balinese pig farmers in the Sukanadi Farmer Women's Group in Pejarakan Village, Gerokgak Subdistrict, Buleleng Regency that farmers in conducting Balinese pig livestock businesses are more effective and efficient after obtaining/making feed with fermentation technology (Yan Tonga, et al., 2022).

Information on traditional and fermented feeds and their nutritional content/quality as well as the impact of feeding on performance/growth in pigs does not yet exist. This encourages research to be carried out, to enrich the

repertoire of science, especially in the development of local / Balinese pig growth based on abundant local feed resources that are most effective and efficient. The expected benefit of the results of this study is to be a recommendation for the preparation of feed formulations in feeding Balinese pigs in the Sukanadi Women Farmers Group.

THEORETICAL REVIEW

1. Balinese Pig

In Indonesia, several breeds of local pigs are derived from *Sus Scrofa* and one of the local pigs derived from *Sus Scrofa* is *the* Balinese pig (Figure 1). According to Hartatik *et.al*, (2014) the *cytochrome B* allele owned by Balinese pigs is the same as the *landrace* pig allele.

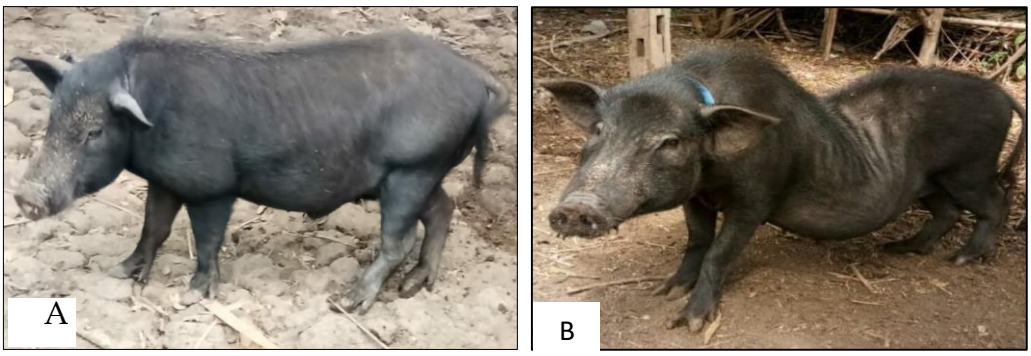

Figure 1. (A) Male Bali Pig, (B) Female Bali Pig

Siagian (2014) states that there are two types of Balinese pigs in Bali, namely those in the East and in the North, South and Central regions. Balinese pigs in the eastern region have black characteristics and rough fur, their backs are curved but their bellies do not touch the ground, their snouts are slightly longer. Balinese pigs in the North, South and Central regions are characterized by a curved back, enlarged belly with white stripes on the four legs, short snout, pointed ears, 54 cm height, 90 cm length, and 20-25 cm tail length (Hartatik, 2013; Soewandi, 2013; Hartatik *et.al*., 2014; Siagian, 2014). Balinese pigs have a Average Daily Gain of 0.14 ± 0.05 kg (Soewandi, 2013).

The results research of Yan Tonga, et al. (2021) showed that 100% of male and female Balinese pigs were black and a small portion of the back curved down to touch the ground by 16.67% in male and female Balinese pigs in Buleleng Regency. It was also reported that the average body weight and body length of male Bali pigs were 65.50 kg and 72.37 cm, while female Bali pigs were 62.10 kg and 74.73 cm. Furthermore, Sudiastra and Budaarsa (2015) reported that the exterior of Balinese pigs is black and some are black with white stripes on the belly and four legs. The main characteristic of Balinese pigs is that the belly curves downward.

The qualitative characteristics of Balinese pigs can be observed based on their black characteristics and coarse hair, back, snout or head shape and ear shape (Bayu Dewantoro and Talib, 2015). According to Siagian (2014), the characteristics of Balinese pigs in the North (Buleleng Regency), South and

Central regions have black skin color with white stripes on the four legs, curved back and no coarse hair, enlarged abdomen, short snout and tapered ears. Furthermore, the results of the study by Sudiarta and Budaarsa (1970) obtained characteristics of black and white color on the legs, under the belly and behind the head there is a white ring, the length of coarse hair on the back in males and females can be 10 cm.

According to Hartati *et.al*., (2014) that Balinese pigs and Timorese pigs come from the same nation, namely the *Sus Scrofa* pig nation. Furthermore, it is said that Timorese pigs have various characteristics of dominant black skin color, followed by black, white and brick red stripes, at times the belly touches the ground if they are fat or pregnant, coarse hair on the back, legs and snout.

Quantitative traits of Balinese pigs can be observed based on height, body length, chest circumference, body weight. The results of the study of Sudiarta and Budaarsa (1970) on height, body length, chest circumference in Buleleng Regency are 55-63 cm (height), 97-137 cm (body length), 92-135 cm (chest circumference) while in Klungkung and Karangasem Regencies are 52-58 cm (height), 107-124 cm (body length), 85-102 cm (chest circumference). Furthermore, the average body weight in the 3 regencies is between 90-100 kg in finisher phase Balinese pigs aged over 10-18 months.

2. Pig Growth

Growth is the increase in body weight or body size according to age, while development is related to changes in the size and function of various parts of the body from embryo to adulthood. The process of livestock growth starts from the onset of growth until the calf is born, continuing until it becomes an adult. Some of the main factors affecting growth before weaning are genotype, birth weight, mother's milk production, number of kids per birth, mother's age, sex and weaning age. The growth pattern of livestock depends on the management system used, the level of feed nutrition, health and climate. Furthermore, the growth rate of pigs is strongly influenced by weaning weight, piglets with a larger weaning weight will grow faster and take a shorter time to reach slaughter weight (Sihombing, 2006).

Sihombing (2006) stated that the average body weight gain of pigs in the growth phase is 290 gr/head/day while Redempeta, et. al., (2019) stated that body weight gain in pigs that are reared improperly ranges from 180-260 gr/head/day. This is still below the standard of the NRC (1997) of 500-750 gr/head/day.

3. Ration Consumption

Rations are finished feeds ready to be given to livestock that are composed of various types of feed ingredients that have been calculated based on needs. A balanced ration provides all the food substances needed to feed livestock for 24 hours. Ration consumption is influenced by body weight and age of the animal (Aggorodi, 1994).

Pigs require nutritionally balanced rations for optimal reproduction and production. Pigs need energy, protein, minerals, vitamins and water. Each substance has a function and relationship in the body. Lack of one or inequality of food substances can slow growth (Brown, 1990).

NRC (1998) stated that the daily ration consumption of pigs in the starter period is 950 - 1425 gr/head/day with an average of 1250 gr. Sembiring (2003) reported that the average consumption of pigs in the growing period is 1,450 - 1,530 kg/head/day. Sihombing (2006) stated that the average ration consumption of pigs is 3.530 kg/head/day in the growing phase with dry rations. Meanwhile, if the ration in wet form is given on average 10% of body weight as reported by Susan, et al (2021) that pigs given fermented rations can increase body weight gain from 150 gr/head/day to 233 gr/head/day.

4. Feed Conversion Ratio (FCR)

Feed conversion ratio is one way of evaluating livestock performance. It is obtained from the amount of food consumed divided by the measured body weight growth (Sihombing, 2006). Furthermore, it is said that the factors that affect feed conversion in pigs are unbalanced rations, genetics, disease and environmental conditions. It is also said that ration conversion shows the level of efficiency of ration use for livestock, and determines the economic value of each ration use which is closely related to production costs.

METHODOLOGY

Location and Duration of Research

This research was conducted at the Sukanadi Women Farmers Group in Pejarakan Village, Gerokgak Sub-district, Buleleng Regency which is 125 km from the provincial capital. This research was conducted for 6 months.

Research Tools and Materials

In this study, 10 Balinese pigs aged 2-3 months with an initial weight of 10-12 kg were used. The materials needed are banana stalk feed, forage (lamtoro leaves), complete feed (mixture of rice bran, corn and concentrate), bioster probiotics, molasses and supplements. While the tools needed are livestock scales, feed scales, feeding and drinking places and cage plots.

Research Methods

This study will test 2 types of feed treatments, namely: traditional feed without fermentation (T) and fermented feed (F). Each treatment was repeated 5 times, resulting in 10 pigs being used.

The traditional unfermented feed was 70% banana stem, 20% lamtoro leaf, 10% complete feed (25% rice bran, 50% fine corn and 10% concentrate) boiled (nutrient content: crude protein 9.19%, crude fiber 27.61% and crude fat 12.05%). While fermented feed is feed from 70% banana stalks, 20% lamtoro leaves, 10% complete feed (mixture of 25% rice bran, 50% fine corn and 10% concentrate) fermented with 10 ml probiotic booster, 20 ml molasses and 5 grams Trypi supplement for 10 kg of feed ingredients processed for 7 days (nutritional content: crude protein 13.34%, crude fiber 20.27% and crude fat 7.05%). While the standard nutritional requirements for grower phase pigs with body weight of 10-50 kg are crude protein 15-20%, crude fiber 7-8% and crude fat 6-7% (NRC,1998).

Feed was given in fresh form every day at 10% of body weight and drinking water was given ad libitum.

The variables observed were initial body weight, final body weight, weight gain, ration consumption, and feed conversion ratio. Direct weighing was done every 2 weeks for 4 months.

1. Initial body weight: pigs were weighed at the beginning of the study.
2. Final body weight: pigs were weighed at the end of the study.
3. Average daily gain per day: final body weight minus initial body weight then divided by the length of observation time
4. Feed consumption per day: total feed consumption during observation divided by the length of observation time.
5. Feed conversion ratio: amount of feed consumed divided by body weight gain

Data Analysis

To determine whether there is a difference between the treatments tried, the data obtained in this study were analyzed using the ***t-test*** (paired test) according to Steel and Torrie (1991).

RESULTS

The implementation of the study began with the adaptation of Balinese pigs to fermented feed for 1 month. After that, the pigs were treated with traditional feed and fermented feed. Every day weighing of feed and feed residue was carried out and body weight weighing was carried out every 2 weeks.

The results of the initial body weight, final body weight, weight gain, ration consumption, and feed conversion ratio are shown in Table 1.

Table 1. Average Performance of Balinese Pigs Fed Traditional and Fermented Feeds

No.	Variables	Feed Type	
		Traditional (T)	Fermentation (F)
1	Initial body weight (kg/head)	12,64[a]	12,44[a]
2	Final body weight (kg/head)	22,92[a]	23,58[a]
3	Average Daily Gain (g/head/day)	168,52[a]	182,62[a]
4	Ration consumption (g/head/day)	1544,23[a]	1462,70[a]
5	Feed conversion ratio (FCR)	8,89[a]	8,01[a]

Notes: Numbers Followed by the Same Letter Indicate No Significant Difference (P>0.05)

DISCUSSIONS

Based on the results in Table 1, it shows that the final body weight and weight gain are higher in pigs given fermented feed than traditional ones. The final body weight of pigs given fermented feed was higher by 0.66 kg while the weight gain was higher by 14.1 g/head/day, but statistically the two treatments were not significantly different (P>0.05). Body weight at the end of this study was between 22.92 kg (traditional feed) and 23.58 kg (fermented feed) at the time the age of the pigs used in the study was 6 months. This result is in accordance with the report of Pangestika (2010) which states that the body weight of local pigs on the island of Bali is between 20-30 kg/head aged 6-7.9 months. While the average daily gain (ADG) in this study was 168.52 g/head/day (traditional feed) and 182.62 g/head/day (fermented feed) which is in accordance with the Hartatik report, *et. al.*, (2013) which states that Balinese pigs have ADG of 140 ± 50 g/head/day or around 90-190 g/head/day. However, the results of this study are lower than the ADG of imported pigs which ranges from 200-330 g. The low body weight and ADG in this study were due to management and physiological environment, especially feed, so that if the feed consumed does not meet the needs of livestock in terms of nutrient content, it cannot achieve optimal growth. This is also in accordance with the opinion of Basuki (2002) and Sihombing (2006) which states that pigs in the grower phase are a period that must be considered for their food needs, high quality feed and meet the pig's standards. According to NRC (1998), the protein requirement for pigs weighing 10-50 kg in the grower phase is 15-20% and the crude fiber is 7-8% so as to get ADG between 500-750 g/day. However, these results are still below the standard requirements, namely: the protein content in the feed in this study was 9.19% (traditional feed) and 13.39% (fermented feed) and the crude fiber was high, namely: 27.61% (traditional feed) and 20.27% (fermented feed) which resulted in less than optimal pig growth. This is also confirmed by the opinion of Fuah, *et.al*., (2021) who reported that the feed consumed by local pigs on Timor Island with a protein content of 14% and crude fiber of 17.5% resulted in very slow growth. Furthermore, it is said that rations containing high crude fiber are not optimally digested by pigs because the pig digestive system is simple so it is not allowed for pigs to be given feed with high crude fiber.

In the variable of feed consumption and feed conversion in pigs given fermented feed, the average value is lower than the traditional one. Feed consumption in the treatment given fermented feed was lower at 81.53 g/day while the feed conversion was lower at 0.88, but statistically the two treatments were not significantly different (P>0.05). Feed consumption was not significantly different in this study, possibly due to age, environment and nutrient content, especially energy. This is in accordance with the opinion of Sinaga (2002) that high and low feed consumption is generally influenced by palatability and energy in the ration. Furthermore, Anggorodi (1994) stated that feed consumption increases when the energy content is low and if feed consumption decreases, the energy content is high. Sinaga and Martini (2010) stated that one aspect that determines the high and low quality of feed is the protein and energy content. Based on these results, it illustrates that the nutritional quality of

fermented feed is better than traditional feed because the final body weight and weight gain show higher average values even though the amount of feed consumed is lower. The increase in feed quality is due to the fermentation process of the feed, as stated by Yan Tonga (2021) that the fermentation process is able to increase nutrient content, protein, increase digestibility value and energy and reduce crude fiber value.

The feed conversion variable shows that in pigs given fermented feed is 8.01, meaning that to increase 1 kg of body weight, the pigs will consume as much as 8.01 kg of feed while in pigs given traditional feed, the feed conversion is 8.89, meaning that to increase 1 kg of body weight, the pigs will consume as much as 8.89 kg. So fermented feeding is more efficient and effective for the scale of livestock business. Feed conversion ratio is still high because the high feed consumed has not been matched by optimal results. This is because the nutritional quality of both traditional feed and fermented feed is low in protein content (9.19% - 13.34%) and high in crude fiber (20.27-27.16%) because it is still below the standard needs for grower phase pigs, where according to NRC (1998) the standard protein and crude fiber content according to their needs is 15-20% and 7-8%. Furthermore, it is said that if the protein and crude fiber content can meet the standard needs of livestock, PBBH will increase and the amount of feed consumed can be reduced so that feed conversion ratio can be smaller and the pig farming business is more efficient and profitable.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this study, it can be concluded that the final body weight performance and body weight gain of Balinese pigs given fermented feed are higher while feed consumption and feed conversion ratio are lower and more efficient than those given traditional feed, but statistically not significantly different (P>0.05).

FURTHER STUDY

It is necessary to conduct further research on this fermented feed on the performance of Balinese pigs using 60% banana stems, 30% lamtoro leaves and 10% complete feed and the duration of fermentation is extended by 10-14 days so that the quality of protein nutrient content increases and crude fiber decreases.

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REFERENCES

Anggorodi. R, (1994). General Animal Feeding Science. PT Grameda Jakarta.

Anonimus, (2002). A Complete Guide to Pig Farming. 18th Printing, Kanisius Publishers, Yogyakarta

Basuki, P. (2002). Basic Science of Beef and Working Livestock. Lectures Notes.

Laboratory of Beef and Working Cattle. Faculty of Animal Husbandry, Gadjah Mada University, Yogyakarta.

Fuah, A.N, Rudi Priyanto, Jefirtson, R.R and Fellyanus, H. (2021). Performance of Local Pig Genetic Resources (Sus scropa deomesticus) in Timor Island, East Nusa Tenggara. Bul. Germplasm 27(2):89-100.

Hartatik T, Soewandi B.D.P, Volkandari S.D, Tabun A.C, Sumadi. (2014). Identification Genetics of Local Pigs, Landrace and Duroc Based on Qualitative Analysis. In: SUSTAIN. Yogyakarta (Indonesia): Gadjah Mada University. P. 1-6.

NRC. (1998). Nutrient Requirement of Swine. 10th Received Ed. The National Academies Press.

Patience, J.F., M.C. Rossoni-Serao, and N.A. Gutierez. (2015). A Review of Feed Efficiency in Swine: Biology and Application. J. Anim. Sci. Biotechno. 6: 33-49.

Sihombing, D.T.H. (2006). Pig Livestock Science. 2nd Ed. Gadjah Mada University Press. Bulaksumur, Yogyakarta 55281.

Sinaga, S. (2002). Pig Production Performance Due to Feeding Levels of Layer Manure and Lysine Amino Acid as an Alternative Feed Ingredient. Thesis. Unpad, Bandung.

Sinaga, S and Martini. (2010). Effect of Giving Various Doses of Curcuminoid in Pig Ration for Stater Period on Ration Efficiency. J. Livestock Science. Vol. 10 (2): 95-101.

Steel, R.G.D and J.H. Torrie. (1991). Principles and Procedures of Statistics. 2nd. Edition. PT. Gramedia. Jakarta.

Yan Tonga, I.M. Yudiastari and I.G. Sutapa. (2020). Identification of Qualitative and Quantitative Traits of Balinese Pigs in Gerokgak District, Buleleng Regency.

Yan Tonga, I.G. Sutapa and I.K. Agung Sudewa. (2022). Application of Fermented Feed Technology and Semi-Intensive Pig Farming System in the Women's Farmer Group "Suka Nadi" Pejarakan Village, Gerokgak District, Buleleng Regency. Asian Journal of Applied Research for Community Development and Empowerment (AJARCDE) ISSN 2581-0405. Vol.7, No. 1. 2022