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PERFORMANCE CHARACTERISTICS OF FINISER PHASE LIVESTOCK THAT WAS FEEDED BY WASTE BY SKIMAL FISH AS A PARTICULAR CONCENTRATE SUBSTITUTE

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ABSTRACT

The growth of the body of pigs is an illustration to see the productivity of the livestock. The quality of pork production depends on its growth, because good growth will make good production. The ration is one of the important factors in pig farming. In raising pigs, feed is one of the things that must be considered, namely, the quality and quantity of feed in the ration is one of the most important factors in increasing livestock growth and the level of profits achieved by farmers. This research was carried out in Tondegesan village, Kawangkoan sub-district from June 2021 to October 2021. This study used a completely randomized design (Stell and Torrie, 1991) consisting of 4 treatments and 5 replications. An important factor in supporting growth is feed. Feed is a mixture of food ingredients that will be given to livestock. For this reason, research has been carried out on replacing part of the concentrate with skipjack tuna flour to see the extent of its effect on body length, height and chest circumference in pigs. The livestock used were 20 pigs aged 13 weeks with an average weight of 61 kg. This study used a completely randomized design method consisting of 4 treatments and 5 replications, with experimental levels of 0%, 4%, 8% and 12%. The results of the analysis of variance showed that the partial replacement of the concentrate with skipjack tuna flour at levels of 4%, 8% and 12% gave no significant difference. For this reason, research has been carried out on replacing part of the concentrate with skipjack tuna flour to see the extent of its effect on body length, height and chest circumference in pigs. The livestock used were 20 pigs aged 13 weeks with an average weight of 61 kg. This study used a completely randomized design method consisting of 4 treatments and 5 replications, with experimental levels of 0%, 4%, 8% and 12%. The results of the analysis of variance showed that the partial replacement of the concentrate with skipjack tuna flour at levels of 4%, 8% and 12% gave no significant difference. For this reason, research has been carried out on replacing part of the concentrate with skipjack tuna flour to see the extent of its effect on body length, height and chest circumference in pigs. The livestock used were 20 pigs aged 13 weeks with an average weight of 61 kg. This study used a completely randomized design method consisting of 4 treatments and 5 replications, with experimental levels of 0%, 4%, 8% and 12%. The results of the analysis of variance showed that the partial replacement of the concentrate with skipjack tuna flour at levels of 4%, 8% and 12% gave no significant difference. The livestock used were 20 pigs aged 13 weeks with an average weight of 61 kg. This study used a completely randomized design method consisting of 4 treatments and 5 replications, with experimental levels of 0%, 4%, 8% and 12%. The results of the analysis of variance showed that the partial replacement of the concentrate with skipjack tuna flour at levels of 4%, 8% and 12% gave no significant difference. The livestock used were 20 pigs aged 13 weeks with an average weight of 61 kg. This study used a completely randomized design method consisting of 4 treatments and 5 replications, with experimental levels of 0%, 4%, 8% and 12%. The results of the analysis of variance showed that the partial replacement of the concentrate with skipjack tuna flour at levels of 4%, 8% and 12% gave no significant difference.or gave the same impact ($P>0.05$) on body length, height and chest circumference of pigs. Replacing some of the concentrate with skipjack tuna flour up to a level of 12% gave the same effect

Keywords: body dimensions, pigs, skipjack fish waste.

1. INTRODUCTION

Wea (2004) stated that the NTT area is an area that has great potential for the maintenance and development of pigs, and pigs have the highest population compared to other livestock. Pigs are one of the livestock commodities that have the potential to be developed. This is because pigs can consume food efficiently, very prolific, namely giving birth twice a year and once giving birth between 10-14 tails (Wheindrata, 2013). Pigs are also a source of meat producers and for nutritional fulfillment are very efficient among other livestock because they have a fairly high conversion of feed, all feed ingredients can be converted into meat and fat (Sudana, 1997). Pigs are very sensitive to the effects of insufficient food and to inadequate maintenance management due to their unusually fast growth and therefore the demand for high-quality food (Dewi, 2017). For this reason, in compiling the ration, there are various things that must be considered so that the ration can have a good effect on livestock and is sufficient according to the needs of the livestock themselves (Ardana and Harya., 2015).

The growth of pigs in the grower period will experience an increase in body weight during growth which is influenced by feed factors (Parakkasi, 1990). Parakkasi (1990) also stated that the growth of pigs was influenced by various factors including age, nutrition, environment, birth weight and disease. The daily body weight gain (PBBH) of piglets after weaning is largely determined by the achievement of the target weight for slaughtering pigs and the ability of the pigs to utilize the given ration (Suranjaya et al., 2016)

The growth of the body of pigs is an illustration to see the productivity of the livestock. The quality of pork production depends on its growth, because good growth will make good production. The ration is one of the important factors in pig farming. In raising pigs, feed is one of the things that must be considered, namely, the quality and quantity of feed in the ration is a very important factor in increasing livestock growth and the level of profits achieved by farmers (Sulastri et al., 2018).

Ration is ready-to-feed feed that is prepared for livestock which is composed of various types of feed ingredients that have been previously calculated based on needs (Pardosi, 2015). The ration is also one of the supporting factors that are very important for livestock for growth, body tissue formation and production. The amount of ration consumed will also increase with increasing age of livestock (Utami et al., 2016). The ration is the biggest factor (about 60-70%) of the production cost, so it is necessary to increase the availability of raw materials in order to increase production (Kaligis, 2017).

Pigs need rations that have a good and perfect nutritional balance for the livestock themselves. Factors that affect ration consumption, such as size and weight, age, livestock condition and stress caused by the environment such as environmental temperature, humidity, and sunlight (Poluan, 2017). One aspect that determines the high and low quality of the ration is the content of protein, energy, vitamins, minerals and other ingredients that support growth and the biological digestive process (Sinaga and Martini, 2010).

The need for nutrients starts from conception until the animal is born. Nutrients are very important to pay attention to because they must be in accordance with the needs of the livestock. The amount of nutrients needed for pigs varies according to the level of growth and the purpose of rearing. According to NRC (1988) the need for nutrients for pigs in the grower phase is where the EM is 3,390 kcal/kg, PK is 14% and minerals are 0.45%, while for the finisher phase, EM is 3,390 kcal/kg, PK is 13% and minerals is 0.4%. .

Concentrate

Concentrate is a mixture of several feed ingredients that are arranged to make a complete ration and balanced food substances. Concentrate is also a feed ingredient that is used with other feed ingredients to improve the nutritional harmony of the whole diet and is intended to be combined and mixed as a supplement (complementary) or complementary feed (Tilman et al., 1991). The concentrate itself has a low crude fiber content. The main nutrients from concentrated feed are energy and protein. Concentrate for livestock is useful for improving the nutritional quality of feed so as to accelerate the growth and development of livestock.

Skipjack Fish Waste

Skipjack tuna is one of the important economic resources produced from Indonesian waters, both as an export commodity and as a domestic consumption commodity to meet national nutritional needs. From these export activities, the country of Indonesia, especially North Sulawesi, received additional foreign exchange which was important for improving the welfare of the population. These industrial activities continuously produce fish waste which can actually be used to make fish meal as animal feed ingredients. The business of making fish meal can use waste because it is relatively cheap and easy to obtain. The fish waste in question is the residue from cutting fish in the fish market as well as by-products from the small, medium and large scale fish processing industry (Daud et al., 2019).

Saud et al, (2019) stated that the waste generated from fishing activities is solid waste in the form of pieces of fish meat, scales and gills, liquid waste in the form of blood, mucus and washing water, while gaseous waste is the odor produced due to chemical compounds. ammonia, hydrogen sulfide or ketones. The use of fish waste as animal feed produces good quality. This is in accordance with a study from Daud et al, (2019) where the use of fish waste in ration formulations has a positive effect on the productivity of laying ducks and has the potential as one of the ingredients for protein source rations. Then in the research results Rimbawanto et al, (2012) fish waste made into silage can be used as a protein source to replace the use of soybean meal or fish meal in ruminants. Then in the results of research by Silitonga et al, (2019) giving fish waste in the form of silage at a 15% level in broiler chickens has a good effect on livestock. Baye et al, (2015) fish waste meal can be used up to 15% in broilers. Then in the research of Daud et al, (2020) the use of a combination of fish waste as much as 10% in the ration formulation gave a good effect on male local ducks. Then Saud et al, (2019) the use of 6% level of fish waste flour as a substitute for concentrate in pigs produces good quality. (2019) giving fish waste in

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Livestock body dimensions are quantitative properties that can be used to determine differences between livestock types or selection. Body dimensions are often also used to evaluate growth because dimensions are an important indicator of growth. Body dimensions commonly observed in cattle include chest circumference and body length. Body dimensions can be used to estimate body weight and carcass weight, as well as provide an overview of the animal's body shape as a characteristic of a particular breed of livestock.

Body length is the distance from the anterior part of the cervical vertebrae to the sacrale tube or the straight distance between the shoulder bump to the sitting bone / sieve bone (Tuber ischii) (Saranjaya et al., 2016).The length of the body consists of the front, namely from the shoulder to the back of the scapula joint, the middle part consists of the chest and ribs, the back consists of the waist to the thigh (Pasaribu, 2015).

The increase in height or height can be measured starting from the tip of the forefoot perpendicular to the shoulder in the middle of the shoulder using a measuring tape and the cattle to be measured must stand upright (Tefa et al., 2017). Body height or shoulder height is a measurement from the highest distance of the shoulder to the ground using a measuring tape (Pasaribu, 2015). According to Johansson and Rendel (1968) stated that shoulder height in livestock is more influenced by bone growth, not influenced by meat or muscle. The increase in chest circumference can be measured by wrapping a measuring tape around the chest (the long axis of the body) just behind the elbow and the cattle to be measured must stand upright (Tefa et al., 2017).

2. RESEARCH METHODS

This research was carried out in Tondegesan Village, Kawangkoan District on Mr. Edo Goni's farm from June 2021 to October 2021. The livestock used were 20 pigs aged 13 weeks with an average weight of 61 kg. The cage used in this study was an individual cage measuring 1.54 m long, 1 m high and 0.46 m wide, equipped with a 30×46 cm dining area made of concrete and a drinking bowl.

This study used a completely randomized design (Stell and Torrie, 1991) consisting of 4 treatments and 5 replications. The composition of the treatment ration is:

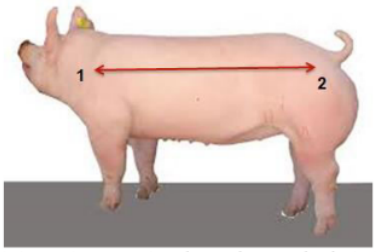
R0 = Concentrate 18% + Skipjack Fish Waste Flour 0%
R1 = Concentrate 14% + Skipjack Fish Waste Flour 4%
R2 = 10% Concentrate + Skipjack Fish Waste Flour 8%
R3 =6% Concentrate + Skipjack Fish Waste Flour 12%

Research variable

Body Length Gain

The increase in body length is obtained bymeasuring from the anterior part of the cervical vertebrae to the sacrale tube or the straight distance between the shoulder lump to the sitting bone / sieve bone (Tuber ischii)through the back line using a measuring tape and the animal to be measured must stand upright(Saranjaya*et al*., 2016). Body length measurements were carried out once a week. The increase in body length is calculated based on the following formula:

$$\text{PPB (cm/hari)} = \frac{\text{PB Akhir} - \text{PB Awal}}{\text{Waktu Penelitian (hari)}}$$



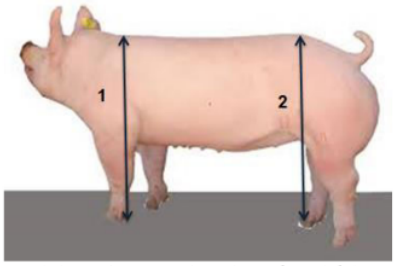
(Figure 1. Measuring the Body Length of Pigs)

Information :
1. The spine (vertebrae thoracales)
2. Sitting bone (Tuber ischii)

Height Gain

Height is obtained by measuring from the tip of the forefoot perpendicular to the shoulder in the middle of the shoulder using a measuring tape and the animal to be measured must stand upright. Height measurement is done once a week. Height gain is calculated based on the following formula:

$$\text{PTB (cm/hari)} = \frac{\text{TB Akhir} - \text{TB Awal}}{\text{Waktu Penelitian (hari)}}$$



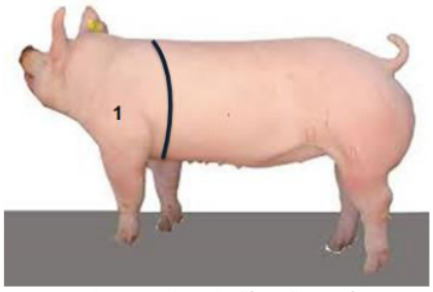
(Figure 2. Measuring Pig Body Height)

Information :
1. Forelimb
2. hind limbs

Chest Circumference

Chest circumference is obtained by wrapping a measuring tape around the chest just behind the elbow and the animal to be measured must stand upright. Measurement of chest circumference was done once/week. The increase in chest circumference is calculated based on the following formula:

$$\text{PLD (cm/hari)} = \frac{\text{LD Akhir} - \text{LD Awal}}{\text{Waktu Penelitian (hari)}}$$



(Figure 1. Measuring Pig Chest Circumference)

Information :
1. Looping the measuring tape on pigs

Research procedure

Pigs were weighed and then placed randomly in each cage and given rations every day ad libitum. Fish waste as treatment was taken from PT. Nicindo, South Minahasa Regency. Treatment given skipjack tuna waste meal 0,

4, 8, 12% in the ration. Measurements of body length gain, height gain, and chest circumference were measured every 2 weeks during the study.

Research Hypothesis

The hypothesis used in this study, namely:

H0 : Skipjack tuna waste flour as a substitute for some of the concentrate in the ration has no effect on the body dimensions of pigs.

H1 : Skipjack tuna waste flour as a substitute for some of the concentrate in the ration affects the body dimensions of pigs.

3. RESULTS AND DISCUSSION

Effect of Treatment on Body Length Gain

The data from the observations and the average calculation of the partial replacement of concentrate with skipjack fish meal on the body length of the pigs from the grower to the finisher phase are listed in table 4.

Table 4. Average increase in body length of pigs per head/day from each treatment during the study (cm).

Test	Treatment			
	R0	R1	R2	R3
I	0.37	0.31	0.36	0.37
II	0.30	0.35	0.33	0.50
III	0.23	0.38	0.32	0.36
IV	0.43	0.40	0.37	0.45
V	0.40	0.53	0.40	0.35
Total	1.73	1.95	1.77	2.03
Average	0.35	0.39	0.35	0.41

The increase in body length is the distance from the anterior cervical vertebrae to the sacrale tuber or the straight distance between the shoulder bumps to the sitting bones / sieve bones (Tuber ischii) (Saranjaya et al., 2016). The average of the measurement results on the increase in body length of research pigs (Table 4), the data shows that the highest average body length gain was obtained in pigs that received R3 treatment (0.41 cm) and the lowest was in R0 treatment (0.35 cm). .

Results of analysis of variance showed that the treatment had an insignificantly different effect (P>0.05) on the body length of pigs or in other words, partial replacement of concentrate with skipjack tuna flour with levels of 4%, 8% and 12% gave the same impact on body length. pigs. This is presumably because the treatment of R1, R2 and R3 is still within the recommended standard, so thatcauses the increase in body length of pigs the same.Tefa*et al*., (2017) stated that the content of nutritional substances such as protein, energy and mineral balance of Ca and P in the treatment rations given to livestock in relatively the same amount will give a relatively similar response, this is in accordance with Bhoja's opinion.*et al*., (2019) The nutritional content of almost the same ration substances gives the same effect too.This is further supported by Sinaga and Martini (2010) who state that the development of the livestock body is influenced by the nutritional level of the ration used.

Effect of Treatment on Height Gain

Height gain is one indicator of increasing body size or the growth of an animal (Hana et al., 2015). The increase in height observed was the increase in the height of the forelegs and the increase in the height of the hind limbs.

Data from observations and calculation of the average of the partial replacement of concentrate with skipjack fish meal on body height of pigs from the grower to finisher phases are listed in table 5 and the increase in hind limb height is table 6.

Effect of Treatment on Increase in Facial Leg Height

The results of measurements of the increase in the height of the forelegs of pigs in this study can be seen in table 5.

Table 5. Average Increase in Front Leg Height of Pigs per Head/Day from Each Treatment During the Study (cm)

Test	Treatment			
	R0	R1	R2	R3
I	0.25	0.31	0.18	0.30
II	0.21	0.33	0.27	0.27
III	0.21	0.28	0.28	0.22
IV	0.23	0.22	0.17	0.10
V	0.12	0.23	0.25	0.11
Total	1.01	1.36	1.14	1.00
Average	0.20	0.26	0.23	0.21

The height of the forelegs is one of the parameters to measure the body dimensions of pigs that describe the growth of livestock (Lapian, 2012). The height of the forelegs (cm) is measured from the sole of the foot to the protrusion of the shoulder bones (Lapian, 2012; Saranjaya*et al.*, 2016). From the data, it was shown that the highest average height gain of forearm pigs was obtained by pigs that received R1 treatment (0.27 cm) and the lowest was at R0 (0.20 cm).

The results of the analysis of variance showed that the treatment had an insignificantly different effect (P>0.05) on the height of the forearm of pigs or in other words, the partial replacement of concentrate with skipjack tuna flour with different levels of 4%, 8% and 12%. not significant or give the same impact on the height of the forelegs of pigs. This is because the nutrients contained in food substances are still within the recommended standards including the mineral balance of Ca and P. The balance of Ca and P in the ration plays a role in the formation of bone tissue (Pamu et al., 2020). Leg height in pigs is influenced by bone growth because bone grows earlier than muscle and fat, so the balance of minerals such as Ca and P plays an important role in bone growth (Rahmawati et al., 2018).

The Effect of Treatment on Rear-Limb Height Gain

The results of measurements of the increase in hind limb height in pigs in this study can be seen in table 6.

Table 6. Average Increase in Front Leg Height of Pigs per Head/Day from Each Treatment During the Study (cm)

Test	Treatment			
	R0	R1	R2	R3
I	0.23	0.29	0.23	0.28
II	0.19	0.31	0.25	0.35
III	0.18	0.30	0.32	0.17
IV	0.15	0.25	0.15	0.28
V	0.25	0.25	0.25	0.19
Total	1.00	1.40	1.20	1.27
Average	0.20	0.28	0.24	0.25

The height of the hind limbs is one of the parameters for measuring the body dimensions of pigs that describe the growth of livestock, the height of the hind limbs (cm) is measured from the sole of the foot to the protrusion of the shoulder bones (Lapian, 2012). From the data it shows that the highest average increase in hind limb height was obtained by pigs that received R1 treatment (0.28 cm) and the lowest was at R0 (0.20 cm).

The results of the analysis of variance, showed that the treatment gave an insignificantly different effect (P>0.05) on the height of the hind limbs of pigs or in other words, the partial replacement of concentrate with skipjack tuna flour with different levels of 4%, 8% and 12%. not significant or have the same impact on the height of the hind limbs of pigs. This is because the nutrients, including minerals Ca and P, are almost the same in the treatment rations, so that the nutrients that support the growth of the animal's body components (skeleton/bone) are relatively the same. NRC (1988) states that shoulder height in cattle is more influenced by bone growth, not meat or muscle. Pamu et al., (2020) stated that the minerals Ca and P play a role in the formation of bone tissue and bone growth. The relatively the same Ca and P treatments gave a not much different effect (Zogara et al., 2020). Tanghamap et al., (2016) stated that the nutritional content of the ration

consumed by pigs, especially the Ca and P content was relatively the same, causing relatively similar bone growth.

Effect of Treatment on Increase in Bust Circumference

The data from the observations and the average calculation of the partial replacement of concentrate with skipjack fish meal on the breast circumference of pigs from the grower to finisher phases are listed in table 7.

Table 7.Average Gain Breast Circumference of Pigs per Head/Day from Each Treatment During the Study (cm).

Test	Treatment			
	R0	R1	R2	R3
I	0.42	0.38	0.21	0.39
II	0.40	0.35	0.33	0.42
III	0.27	0.55	0.40	0.46
IV	0.34	0.33	0.30	0.55
V	0.21	0.38	0.28	0.31
Total	1.64	1.99	1.52	2.13
Average	0.33	0.40	0.30	0.43

Chest circumference is obtained by wrapping a measuring tape around the chest just behind the elbow and the cattle to be measured must stand upright (Tefa et al., 2017). The results of measurements of the increase in chest circumference of research pigs are in Table 8, from the data it shows that the highest average increase in chest circumference was obtained in pigs that received treatment R3 (0.43 cm) and the lowest was in treatment R2 (0.30 cm).

The results of the analysis of variance, showed that the treatment had a significantly different effect (P>0.05) on the chest circumference of pigs or in other words, partial replacement of concentrate with skipjack tuna with levels of 4%, 8% and 12% had an impact on the same for the chest circumference of pigs. The increase in chest circumference for each treatment was relatively the same because the content of nutrients (protein, energy, minerals Ca and P) from the research rations were relatively the same. Tefa et al., (2017) stated that cattle are in the growth phase, the increase in chest circumference is due to an increase in the size/growth of muscle tissue, fat and bone. For the growth / development of muscle tissue and fat is needed especially protein and energy. Pujianti et al.,

4. CONCLUSION

Replacing some of the concentrate with skipjack tuna flour up to a level of 12% gave the same effect.

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