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EVALUATION OF SLUDGE SUBSTITUTION IN NEW ZEALAND WHITE RABBIT FEED IN TERMS OF CARCASS AND NON-CARCASS PRODUCTION

BY

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Abstract

New Zealand White rabbits are one of the broiler rabbits that have high adaptability, especially in tropical climates. This study aims to determine the provision of dairy cow sludge in New Zealand White rabbit feed on slaughter weight, carcass, and non-carcass production produced. The materials were 20 weaned male rabbits (6-8 weeks old) grouped by body weight (small and large) and five treatments (P0: control, P1: 5% sludge, P2: 10% sludge, P3: 15% sludge and P4: 20% sludge). This study used experimental method with data analysis of Randomized Group Design. Maintenance was carried out for 6 weeks and cutting was carried out on the last day of maintenance. Based on the results obtained, the addition of sludge did not have a significant effect on carcass weight, non-carcass weight, carcass components, and carcass commercial cuts, except for slaughter weight and bone weight (P<0,05 or P<0,01). The results showed that the provision of 5% sludge gave the best results and could be developed as an alternative feed ingredient for rabbits.

Index Terms- *carcass, feed, non-carcass, rabbit, sludge*

Introduction

The increasing population in Indonesia every year is followed by an increase in food needs and fulfillment of nutrition. Rabbit farming has potential as a food provider of animal protein sources. Having good meat quality with relatively easy maintenance makes rabbit farming a potential business to develop. Rabbits have a relatively fast growth and reproduction period, high feed efficiency, and do not require large cages. The superiority of rabbit meat compared to other meats lies in its fatty acid profile, high protein content, and low cholesterol and sodium. The meat contains high protein of 20-21% with essential amino acids and high digestibility, as well as low fat and cholesterol (Nasr et al., 2017).

Quality rabbit meat is obtained by feeding with quality and quantity according to their needs and good maintenance management. Increased rabbit production certainly goes hand in hand with the availability of feed provided. In providing feed for rabbits, it is expected not to compete with the needs of humans and intensive industrial livestock. The increasing meat production, it is necessary to provide alternative feed at an affordable cost and more efficient in meeting the demand for quality meat (Khan et al., 2016). The utilization of waste processed into feed is one step in overcoming environmental problems due to abundant waste every day (El-Kady et al., 2021). Livestock waste is the remaining waste from a livestock business in the form of solid waste and liquid waste which is put into the biogas unit digestion tank to produce sludge (Bio Gas Unit Organic Waste). A cow can produce 4-6 tons of solid manure in a year or about 11-16 kg/day (Yadav, 2013). Cow feces vary in content depending on the type of feed consumed, the amount of feed, and the breed of cow, with colors varying from greenish to blackish.

The content contained in rabbit feed is the main key in increasing rabbit production (Zepeda-Bastida et al., 2019). One indicator in evaluating the quality of feed by observing the weight gain of livestock. the higher the daily body weight is an indication of better growth. There is a significant difference between rabbits that are fed ad libitum and those that are restricted (Chodova et al., 2016). Excessive concentrate feeding can cause rabbits to experience diarrhea (Noor, 2010 in Nanda, et al (2019)). The appropriate quality and quantity of feed must be followed by good and appropriate management as well in order to obtain optimal body weight during its growth period. In accordance with the statement of Llambiri et al. (2018) that maintenance management affects the quality of carcasses produced. Rabbit carcass production and quality are influenced by nation, feed, body size, environment, age, cutting weight, pre- and post-cutting treatment. This study aims to determine the effect of alternative feeding based on

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dairy cow sludge on slaughter weight, carcass and non-carcass production, and carcass percentage in New Zealand White rabbits.

MATERIALS AND METHODS

The materials used in this study were 20 weaned New Zealand White male rabbits (6-8 weeks old) divided into two groups (large and small) based on initial body weight. The average initial body weight of rabbits used was 1000-1500g. Rabbits were placed in a cage measuring 60x50x50cm with a distance of 20cm between the cage and the floor individually. Feeding was done twice a day at 7:00 am and 4:00 pm with 100g/head/day, while drinking water was given adlibitum. This study used five treatments according to the percentage of sludge given, P0: control, P1: 5% sludge, P2: 10% sludge, P3: 15% sludge and P4: 20% sludge. The nutritional content of the feed given can be seen in Table 1. At the beginning of maintenance, adaptation was carried out for one week, then continued maintenance and data collection for 6 weeks

Table 1. Feed ration of each treatment

Parameters (%)	Mean±sd				
	P0	P1	P2	P3	P4
Dry matter**	90,35±0,09^{b}	90,88±0,05^{bc}	91,41±0,44^{c}	87,41±0,17^{a}	91,11±0,12^{c}
Ash content**	11,65±0,13^{a}	11,73±0,12^{a}	11,94±0,12^{a}	12,23±0,11^{b}	13,07±0,26^{c}
Crude protein**	15,95±0,08^{b}	16,62±0,13^{c}	14,94±0,08^{a}	14,92±0,08^{a}	14,87±0,09^{a}
Crude fiber**	13,58±0,15^{a}	14,34±0,34^{b}	16,29±0,17^{c}	18,03±0,11^{d}	18,83±0,14^{e}
Crude fat**	4,25±0,16^{c}	3,33±0,13^{a}	3,24±0,08^{a}	3,52±0,08^{b}	3,03±0,10^{a}
ADF**	10,62±0,43^{a}	12,10±0,12^{b}	12,35±0,12^{b}	12,67±0,13^{bc}	12,86±0,09^{c}
NDF**	12,25±0,10^{a}	14,06±0,10^{b}	14,37±0,15^{c}	14,87±0,11^{d}	15,02±0,04^{d}

Note: a,b,c,ddifferent superscripts indicate significant differences *= (P<0.05), **= (P<0.01). tn= not significant

Variables measured

Variables measured included slaughter weight, carcass and non-carcass weight, and carcass percentage. The process of slaughtering livestock begins with 12 hours of satisfaction. Prior to slaughter, animals were weighed to determine their slaughter weight while checking the physiological condition and health of the animals. Slaughter is carried out in accordance with Islamic law by cutting 3 channels at once, namely the blood channels (artericarotis and jugular vein), respiratory tract (trachea), and digestive tract (oesophagus). The blood that comes out is weighed, followed by weighing the skin, front and hind legs, head, tail, internal organs (lungs, heart, liver, digestive tract) to determine the weight of the resulting non-carcass. The carcasses obtained after the separation were aged at 4°C for 24 hours (Honrado, et al., 2023). After aging, meat, bone, and fat were separated to determine the weight of each part.

Data Analysis

The data of this study were processed using Randomized Group Design followed by Duncan's Multiple Range test or UJBD if there were significant effects and differences. The following is the mathematical model of the Randomized Group Design:

$Yij = \mu + \beta j + \varepsilon ij$; I = 1,2,…, p ; j=1,2,.., r

Description:

Yij: Observation value in the i-th treatment of the j-th replication

μ : General mean value

βj : Effect of i-th treatment

Σij : Experimental error (error) on treatment

i : 1, 2, 3, 4, 5

j: 1, 2, 3, 4

RESULTS AND DISCUSSION

Rabbit carcass production and quality are influenced by breed, feed, body size, environment, age, slaughter weigght, pre and post-cutting treatments. During rearing, the ambient temperature is ideal ranging from 23-26°C with 73-83% humidity. The carcass percentage of young rabbits is 50-54% of the total slaughter weight (Siregar, 2014). Livestock used in this study must meet the requirements, namely, have a healthy body, no defects, ears do not feel cold, active behavior, and have cleare eyes and shiny fur.

Slaughter weight, carcass weight, noncarcass weight and carcass percentage

The result of the anaylisis in table 2 show that there are very significant differences (P < 0.01) on slaughter weight but not on carcass weight, non-carcass weight, and carcass percentage. The data obtained showed the results of slaughter weight respectively 2085±318.20C, 2017.5±335.88B, 1962.5±328.80B, 1932.5±321.73A, and 1880±332.34A, where the highest value of slaughter weight in P1 while P4 as the lowest slaughter weight. The addition of sludge as much as 20% in the feed resulted in a low slaughter weight presumably due to the increased crude fiber content in the feed given. This is in line with the statement of Bello et al (2022) which says that the increased fiber content in feed can inhibit the absorption of nutrients so that the process of absorption of nutrients in feed is not optimal. The most effective effect on the resulting slaughter weight is the addition of 5% sludge. The slaughter weight has a positive

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correlation with the carcass weight produced, as the data in the table, the highest carcass weight occurred in the P1 feed which was 1087.5 ± 166.17 and the lowest in P4 which was 967.5 ± 180.31. Carcass percentage is calculated based on carcass weight obtained by subtracting stomach contents such as the digestive tract, liver, lungs, heart and skin, head and tail from body weight (Mohammed & Nasr, 2016).

The data shows that there is a positive correlation between slaughter weight, carcass weight, and carcass percentage. An increase in slaughter weight will affect the value of carcass weight and carcass percentage. North et al., (2018) stated that the final result obtained in the form of low non-carcass weight will determine the profit and quality of the carcass produced, inversely proportional if the non-carcass weight is higher, the percentage of farmer losses will also increase. Based on the weight of the carcass produced, the following components are contained in the carcass, namely meat, bone, and fat (Table 3).

Table 2. slaughter weight, carcass weight, noncarcass weight, and carcass percentage of New Zealand White rabbits based on treatment.

Parameters	Mean±sd				
	P0	P1	P2	P3	P4
SW (g)**	2017,5±335,88^{c}	2085±318,20^{d}	1962,5±328,80^{b}	1932,5±321,73^{b}	1880±332,34^{a}
CW (g)^{tn}	1045±183,85	1087,5±166,17	1082,5±243,95	998,5±152,03	967,5±180,31
NCW (g)^{tn}	972,5±152,03	997,5±152,03	880±84,85	935±169,71	912,5±152,03
CP (%)^{tn}	52,76±0,33	53,13±0,14	55,93±3,06	52,73±0,91	52,50±0,31

^{a,b,c,d}Different superscripts indicate significant differences *=(P<0.05), **=(P<0.01). tn= not significant

Table 3. Weight and percentage of rabbit carcass components

Parameters	Mean±sd				
	P0	P1	P2	P3	P4
Meat weight (g)^{tn}	695±142,8	728±145,7	721±199,4	656,5±103,9	635±140
Meat (%)^{tn}	66,33±1,99	66,70±3,20	66,22±3,50	65,79±0,39	65,42±2,28
Bone weight (g)*	255±36,77^{ab}	260±29,70^{ab}	269,5±34,65^{b}	249,5±38,89^{a}	246±29,70^{a}
Bone (%)^{tn}	24,47±0,79	23,98±0,93	25,18±2,47	25,01±0,09	25,59±1,70
Fat weight (g)^{tn}	75±4,24	79,5±9,19	72±9,90	71,5±9,19	66,5±10,61
Fat (%)^{tn}	7,26±0,87	7,47±1,99	6,72±0,60	7,18±0,17	6,89±0,18

^{a,b,c,d}Different superscripts indicate significant differences *=(P<0.05), **=(P<0.01). tn= not significant

The results in Table 3, show that there is no significant difference between treatments based on meat weight, meat percentage, bone percentage, fat weight, and fat percentage, except for bone weight (P < 0.05). Mu'tazi et al. (2019) stated that the weight of meat and fat tends to increase along with the increase in carcass weight, but not the bones. Carcass weight will increase the weight of commercial cuts, including meat weight (Brahmantiyo et al., 2017), while high bone weight can be associated with rabbit cutting weight (Zotte at al., 2015).

Carcass commercial cut

The amount of commercial cuts is influenced by carcass weight, where the higher the carcass weight, the higher the commercial cuts produced. Brahmantiyo et al (2017) stated that commercial cuts of rabbit carcasses are divided into four parts, namely foreleg (front legs), rack (chest ribs), loin (waist), and hindleg (back legs). The following are the results of the analysis of the average weight and percentage of commercial cuts of New Zealand White rabbit carcasses based on treatment (Table 4).

Table 4. Weight and percentace of commercial cut of rabbit carcasses

Parameters	Mean±sd				
	P0	P1	P2	P3	P4
Foreleg weight (g)^{tn}	300,5±92,6	313,5±70,0	313±99,0	264±56,6	272±62,2
Foreleg (%)^{tn}	28,42±3,87	28,67±2,05	28,61±2,70	26,34±1,65	28,00±1,22

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Rack weight (g)[tn]	136±15,56	137±8,49	152,5±12,02	145,5±10,61	131,5±9,19
Rack (%)[tn]	13,36±3,84	12,69±1,16	14,33±2,11	14,66±1,21	13,74±1,61
Loin weight (g)[tn]	216,5±36,06	227±36,77	207,5±53,03	211,5±28,99	202,5±54,45
Loin (%)[tn]	20,74±0,19	20,86±0,20	19,10±0,59	21,23±0,33	20,77±1,76
Hindleg weight (g) [tn]	373±73,54	395,5±57,28	369±73,54	369±73,54	338±49,50
Hindleg (%)[tn]	35,63±0,77	36,39±0,29	34,19±0,91	35,66±0,38	35,07±1,42

[a,b,c,d]Different superscripts indicate significant differences *=(P<0.05), **=(P<0.01). tn= not significant

Based on table 4, there is no significant difference between treatments based on foreleg weight, foreleg percentage, rack weight, rack percentage, loin weight, loin percentage, hindleg weight, and hindleg percentage. The highest value of foreleg weight was found in P1 which amounted to 313.5 ± 70.0 and the lowest value in P3 which amounted to 264 ± 56.6. The highest foreleg percentage is directly proportional to the resulting foreleg weight, which is in P1 at 28.67 ± 2.05, and the lowest in P3 which is 26.34 ± 1.65. The highest value of rack weight is in P2 which is 152.5 ± 12.02 and the lowest value in P4 which is 131.5 ± 9.19, this is not proportional to the percentage of rack produced. The highest rack percentage was in P3 at 14.66 ± 1.21 and the lowest in P1 which was 12.69 ± 1.16. The highest loin weight was produced by P1 carcass at 227±36.77 and the lowest at P4 at 202.5±54.45. Similar to rack, the percentage of loin also does not go straight with the loin weight where the highest percentage of loin is found in P3 which is 21.23 ± 0.33 and the lowest is P2 with a percentage of loin of 19.10 ± 0.59. The difference between the resulting weight and the percentage is due to the amount of slaughter weight and carcass weight of different groups. The last commercial cut is hindleg with the highest value in P1 which is 395.5 ± 57.28 and the lowest in P4 which is 338 ± 49.50, comparable to the highest percentage of hindleg found in P1 which is 36.39 ± 0.29 and the lowest in P2 which is 34.19 ± 0.91

CONCLUSION

Feeding different diets affected slaughter weight and bone weight of New Zealand White rabbits, but not carcass weight, noncarcass weight, other carcass components, and commercial cuts of carcasses. The addition of 5% sludge was the best ration used in this study. Further research is needed regarding the use of sludge as an alternative feed ingredient for New Zealand White rabbits.

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