

The appearance of rabbit production given *Leucaena* leaf flour in the ration

Derek Polakitan, Agustinus N. Kairupan¹, Hasrianti Silondae, Paulus C. Paat

Research Center for Animal Husbandry National Research and Innovation Agency, North Sulawesi, Indonesia

Abstract. Feed is one of the most substantial aspects of financing in the rabbit farming business. Rabbits can breed efficiently with cost-effective feed. This study aims to assess the impact of incorporating *Leucaena* leaf meal into the diet of rabbits on their growth and production. The study was conducted at the North Sulawesi Agricultural Technology Assessment Center (AIAT) from March to May 2020, using 16 New Zealand White broiler rabbits, all males over 3 months old. The experimental design used a completely randomized design with four treatments and four replications. The treatments tested were as follows: P1 - 0% *Leucaena* leaf meal, P2-10% *Leucaena* leaf meal, P3-20% *Leucaena* leaf meal, and P4-30% *Leucaena* leaf meal. Parameters observed include weight gain, feed consumption, and feed conversion. The results are shown as follows: -weight gain: P1-247.45 grams, P2-202.74 grams, P3-196.37 grams, P4-225.70 grams. - Feed consumption: P1-6851.73 grams, P2-6902.88 grams, P3-7590.32 grams, P4-6946.57 grams. - Feed conversion: P1-28.98, P2-37.31, P3-39.98, P4-33.81. These findings suggest that introducing up to 30% *Leucaena* leaf meal into the diet of rabbits does not adversely affect weight gain.

1 Introduction

The demand for animal protein is increasing, along with the increasing population and increasing awareness of the consumption of balanced and diverse nutrition. The pace of demand for livestock products in the form of meat, milk, and eggs is not balanced by the supply. To meet the demand, especially for meat, improvements in the productivity of major producing livestock such as cows, chickens, and pigs must continue, and look for alternative meat substitutes.

Rabbit livestock is one of the potential livestock commodities as a meat provider, because growth and reproduction are fast and easy maintenance does not require large capital [1,2] Further described one reproductive cycle of a rabbit can give 8-10 Cubs at the age of 8 weeks body weight can reach 2 kg or more. Rabbit livestock has the advantage of producing high-quality meat protein content of 20.8% with a fat content of 10.2% and low cholesterol of 0.1%, does not require extensive maintenance area, can utilize feed ingredients from forage and kitchen waste [3,4] As the maintenance of other livestock, the development, and productivity of rabbits is still low due to low seed quality, less optimal maintenance management and the largest feed quality is low, the amount is insufficient and the availability is very volatile sometimes occur scarcity.

¹ corresponding author: audikairupan@gmail.com

Feed plays a very significant role in whether or not the farm business is successful. [5] stated that the role of feed in the field of animal husbandry is very important because it is an integral part and the key to the success of livestock production. Livestock productivity is influenced by genetics, management, and feed [6] To optimize the genetic potential of livestock is done by providing good quality feed, in sufficient quantities and continuously available. Livestock that gets low nutritious food will be relatively small and have less substance, and vice versa cattle that get high nutritious feed have a larger size and complete substance [7]

The processed *Leucaena* leaves in the form of leaf flour are potentially used as ingredients for rabbit rations. Chemical composition of *Leucaena* leaves: Protein 21.5%, BETN 49.5%, SK 14.3%, crude fat 6.5%, ash 6.28%, calcium 2.7%, and phosphor 0.17% [7] The use of *Leucaena* leaves as feed should be limited because they contain antinutrients such as mimosine which can interfere with the biological function of livestock, if consumed in large quantities and continuously for a long period of time [8,9]

The results of previous studies conducted on pigs by the Bogor Livestock Research Institute recommend the use of *Leucaena* leaves in rations not exceeding 20%. It is necessary to study large the amount of use of *Leucaena* leaf flour in rabbit livestock ration. This study aims to determine the use of *Leucaena* leaves in rabbit rations against weight gain.

2 Methods

This research was conducted at the North Sulawesi Agricultural Technology Assessment Center from March to May 2020 from preparation to observation. The materials used in the study were 16 male rabbits bred New Zealand White age 3 months. Feed is given in the formulation of milled corn, coconut meal, rice bran, manufacturer concentrate, *Leucaena* leaf flour, and mineral mix. Equipment used digital scales, basins, stationery, cameras, feed mixing bins, and feed bags.

The cages used are 16 individual cages measuring 50x50x40cm made of wire and equipped with a place to eat and drink. Placement of livestock is carried out randomly. The constituent ingredients of the ration consist of ground yellow corn. Refined brand, manufactured concentrate, fish meal, coconut cake, *Leucaena* leaf meal, and mineral mix. Feed ingredients are mixed based on the portion of the material according to the purpose of the study. The composition of the study ratio consisted of P1= without *Leucaena* leaf flour. P2 = ration with a content of 10% of *Leucaena* leaf flour. P3= ration with 20% content of *Leucaena* leaf flour and P4= ration with 30% content of *Leucaena* leaf flour. The composition of the research ration is shown in Table 1.

Table 1. Composition Of Research Ration Material

Feed ingredients	P1	P2	P3	P4
----- % -----				
Ground yellow corn	45	45	45	45
Rice bran	14	14	14	14
Manufacturer concentrate	5	5	5	5
Fish meal	5	5	5	5
Coconut cake	30	20	10	0
<i>Leucaena</i> Leaf Flour	0	10	20	30
Mineral mix	1	1	1	1

This study uses a complete random design [10] with 4 kinds of treatment: R1= without flour leaves *Leucaena*. P2 = ration with a content of 10% of *Leucaena* leaf flour. P3 = ration

with a content of 20% *Leucaena* leaf flour and P4= ration with a content of 30% flour leaves *Leucaena*, each treatment was repeated 4 times. Variables observed include final weight, consumption, weight gain and feed conversion. The data obtained were analyzed Analysis of variance (ANOVA) One Way, then if there is a difference significantly extended with Duncan's double distance test.

3 Results and Discussion

3.1 Performance of rabbits given *Leucaena* leaf flour in ration

The data of measurement results during the study and analysis of research variables, namely final weight, feed consumption during the study, daily weight gain and feed conversion are shown in Table 2.

Table 2. Effect of treatment on the performance of rabbits

Variable	Treatment			
	P1	P2	P3	P4
	----- g -----			
Final body weight	2504±365.9	1999±419.8	2162±79.34	2218.1±131.3
Weight gain	247±45.49	202±74.8	196±38.14	225.6±70.12
Ration consumption	6851.75±732.74	6902±882.5	7590.5±320.8	6946.5±565.96
Feed conversion	28.9±8.7	37.3±12.2	39.9±8.4	33.8±13.2

P1= without *Leucaena* leaf flour. P2 = ration with *Leucaena* leaf flour 10%. P3= ration with *Leucaena* leaf flour 20% dan P4= ration with *Leucaena* leaf flour 30%

3.2 Effect of treatment on final body weight

The final body weight is an indicator of the selling price of livestock. The heavier the higher the selling price. The final body weight is the final weight achieved at the end of the maintenance process. The achievement of the final weight of rabbit Livestock Research is listed in Table 3.

Table 3. Effect of treatment on the final weight of rabbits during observation

Repeated	P1	P2	P3	P4	Amount
	----- g -----				
R1	2612	1967	2225	2043	8847
R2	2827	2277	2145	2200	9449
R3	2599	1418	2057	2284	8357
R4	1978	2335	2222	2346	8880
Total	10016	7996	8649	8872	35534
Average	2504±365.9	1999±419.8	2162±79.34	2218.1±131.3	

P1= without *Leucaena* leaf flour. P2 = ration with *Leucaena* leaf flour 10%. P3= ration with *Leucaena* leaf flour 20% dan P4= ration with *Leucaena* leaf flour 30%

The results of observation of the effect of treatment on the final body weight obtained in the treatment of P1 rations without flour *Leucaena* average final weight 2504 + 365.9 gr followed by treatment P3= rations containing 20% flour leaves *Leucaena* average final body weight 2162 + 79.34 gr, P4= rations containing 30% flour leaves *Leucaena* average final

body weight 2218.1 (1) 131.3 gr and the last P2= rations containing 10% flour leaves Leucaena average final body weight 2162 + 79.34 gr, P4 = rations containing 30% flour leaves Leucaena average final body weight 2218.1 + 131.3 gr and the last P2= rations containing 10% flour leaves Leucaena average final body weight Agency end of 1999 + 419.8 gr.

The results of analysis of Variance (Table 5) showed that the treatment of the use of Leucaena leaf flour in rabbit rations to a concentration of 30% has not shown effect to the final body weight ($F_{hit} < F_{tab}$).

Table 5. Analysis of covariance the effect of treatment on the final body weight

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	531206.7	3	177068.9	2.121802 ^{ns}	0.150782	3.490295
Within Groups	1001426	12	83452.14			
Total	1532632	15				

(^{ns}) Non-significant ($P < 0,05$)

3.3 Effect of treatment on ration consumption

The ability of rabbits to produce feed within a certain period of time is called ration consumption. [11] states that the basic factor determining livestock productivity is feed consumption. Cattle that have the ability to spend more feed tend to have a more balanced posture. Ration consumption is influenced by factors: ration form, nutritional balance, state of health of livestock, and environmental stress [12] The results of observations of rabbit consumption during the study are shown in Table 6.

Table 6. Effect Of Treatment on Feed Consumption

Repeated	Treatment			
	-----gr-----			
	P1	P2	P3	P4
R1	7634	6028	7975	7199
R2	6476	6353	7334	7617
R3	7271	7973	7318	6381
R4	6026	7254	7735	6589
Total	27407	27608	30362	27786
Average	6851.75±732.74 ^{ns}	6902±882.5 ^{ns}	7590.5±320.8 ^{ns}	6946.5±565.96 ^{ns}

P1= without Leucaena leaf flour. P2 = ration with Leucaena leaf flour 10%. P3= ration with Leucaena leaf flour 20% dan P4= ration with Leucaena leaf flour 30%

The results of observations of the effect of treatment on the consumption of rations obtained the highest consumption data obtained on the treatment of rations containing 20% flour leave Leucaena average 7590.5 + 320.8 gr (P3) followed by rations containing 30% flour leaves Leucaena average 6946.5 + 565.96 gr (P4), rations containing 10% flour leaves Leucaena average 6902 + 882.5 gr (P2) 6851.75 (1) 732.74 GR (P1).

The results of the analysis of Variance (Table 7) showed that the treatment of the use of Leucaena leaf flour in the rabbit ration does not have a real effect ($F_{hit} < F_{tab}$) meaning that the use of Leucaena leaf flour up to 30% in the ration has not shown the difference in the amount of feed consumption. The absence of differences in the treatment of ration consumption, it is suspected that there is a possibility because the nutritional content contained in each treatment is relatively not much different. Stated by [13] that the nutrient composition and ration formulation will affect feed consumption, when the needs of livestock

are met then the livestock will stop consuming feed. High and low energy content of feed will at least affect many rations [14].

Tabel 7. Analysis of covariance the effect of treatment on ration consumption

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1448003	3	482667.6	1.110293 ^{ns}	0.383153	3.490295
Within Groups	5216651	12	434720.9			
Total	6664653	15				

(^{ns}) Non-significant ($P < 0,05$)

3.4 Effect of treatment on weight gain

The highest average weight gain was obtained from the ration without *Leucaena* 247 + 45.49 gr (P1) leaf flour followed by the treatment ration containing 30% *Leucaena* 225.6 + 70.12 gr (P4) leaf flour, the treatment ration containing 10% *Leucaena* 202 + 74.8 gr (P2) flour, and the lowest in the treatment ration containing 20% *Leucaena* 196 + 38.14 gr (P3) leaf flour. The results of observations of the effect of treatment on weight gain are shown in Table 8.

Table 8. Effect of treatment on weight gain

Repeated	Treatment				Amount
	P1	P2	P3	P4	
R1	182	137	155	143	617
R2	257	207	195	200	859
R3	289	158	187	254	887
R4	258	305	247	306	1115
Total	986	806	784	902	3479
Average	247±45.49 ^{ns}	202±74.8 ^{ns}	196±38.14 ^{ns}	225.6±70.12 ^{ns}	

P1= without *Leucaena* leaf flour. P2 = ration with *Leucaena* leaf flour 10%. P3= ration with *Leucaena* leaf flour 20% dan P4= ration with *Leucaena* leaf flour 30%

The results of the analysis of the variance of the effect of treatment on weight gain had no significant effect ($F_{hit} < F_{tab}$). This means that the use of *Leucaena* leaf flour up to 30% in the ration of rabbits gives the same response to weight gain (Table 9). According to [15], weight gain is strongly influenced by feed consumption, in addition to the achievement of optimal body weight is determined by genetic factors, management, environment, and feeding [14].

Table 9. Analysis of covariance the effect of treatment on weight gain

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	6483.542	3	2161.181	0.617373 ^{ns}	0.616917	3.490295
Within Groups	42007.29	12	3500.608			
Total	48490.83	15				

(^{ns}) Non-significant ($P < 0,05$)

3.5 Effect of Treatment on Feed Conversion

The results of observations of the effect of treatment on the value of feed conversion (Table 10), obtained data on the largest feed conversion value in the treatment of rations containing 20% Leaf flour *Leucaena* average 39.9 + 8.4 (P3), followed by rations containing 10% leaf flour *Leucaena* average 37.3 + 12.2 (P2), followed by rations containing 30% leaf flour

Leucaena average $33.8 + 13.2$ (P4) and the lowest in the treatment does not contain leaf flour Leucaena average $28.9 + 8.7$ (P1).

Table 10. Effect of treatment on feed conversion

Repeated	Treatment				Amount
	P1	P2	P3	P4	
R1	41.9	43.9	51.4	50.5	187.7
R2	25.2	30.7	37.6	38.1	131.6
R3	25.2	50.6	39.1	25.1	140.1
R4	23.4	23.8	31.3	21.5	100.0
Total	115.6	149.1	159.4	135.3	
Average	28.9 ± 8.7 ^{ns}	37.3 ± 12.2 ^{ns}	39.9 ± 8.4 ^{ns}	33.8 ± 13.2 ^{ns}	

P1= without Leucaena leaf flour. P2 = ration with Leucaena leaf flour 10%. P3= ration with Leucaena leaf flour 20% dan P4= ration with Leucaena leaf flour 30%

Feed conversion rate describes what amount of food to form weight gain, feed conversion rate shows the efficiency of food use. [16] stated that high feed conversion shows the use of less efficient feed instead of numbers approaching one feed more efficiently. The conversion value obtained from this study is very large. This is due to the feed given to rabbits during the study many are wasted due to the habit of rabbits scavenging for food with both front legs when eating. Be done designing feeding places for rabbits to prevent scattered feed.

4 Conclusion

The utilization of Leucaena leaf meal in rabbit diets, up to a maximum inclusion rate of 30%, did not produce significant differences in weight gain, feed conversion, and feed efficiency of rabbits compared to the control group. This indicates that the Leucaena leaf meal can be a viable food component without reducing the growth potential of livestock and can ensure the economic viability of rabbit farming and its environmental impact because efficient feed utilization is a key consideration in sustainable farming.

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