

Effect of Feeding Water Spinach Waste on Performances of New Zealand White Rabbit

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Abstract— Water spinach is a vegetable widely used for human consumption and cultivated in the tropics. Its waste has a high fiber content and has the potential to be used as rabbit feed. This experimental study used 4 treatments and 5 replications. Forty New Zealand White rabbits were randomly distributed into 4 treatment groups. The experimental feed consisted of a control feed (T₀), and T₁ using water spinach 5%, T₂ using water spinach 10% and T₃ using water spinach 15%. The experimental rabbits were fed until 6 weeks. The results of this study show that the treatments significantly affected feed consumption, body weight gain and feed conversion. The conclusion is that water spinach waste can be used up to the level of 5% as a feed ingredient for New Zealand White rabbits by improving their performances.

Keywords— Water spinach waste, body weight, feed consumption and conversion.

I. INTRODUCTION

Rabbit farming in Indonesia in recent years has increased in terms of population. Rabbits are kept for the purpose of beloved animals and secondly as meat producers. Tourist areas with cold temperatures are mostly the center of rabbit development in Indonesia. Cool-temperature tourist areas such as Batu and Bandung are the favorite area for rabbit farming. Those areas are also known as vegetable-producing centers. Sorted vegetables and vegetable waste in this region will be disposed of, and they are usually used for animal feed. One of the livestock fed with feed from vegetable waste is rabbits.

Rabbits belong to the group of pseudo-ruminant livestock that can take advantage of sources of fiber, because the undigested fiber in the main stomach and small intestine will be digested in the cecum [1]. Rabbit is able to digest feed with a higher crude fiber content even though it is not a ruminant. Rabbits have the ability to use feed that is high in fiber [2]. Feed with Acid Detergent Fiber (ADF) content of 18-21% and Digestible Energy (DE) 2310 – 2460 Kcal/Kg will produce maximum growth. Feed that is too high fiber content of about 35% ADF will lower the daily weight gain and feed conversion rate by 30-50%.

Rabbit feed given by farmers is generally in the form of grass and vegetables wastes and also added concentrates to meet the nutritional needs of rabbits [3]. Feeding rabbits is usually carried out by farmers by providing feed ingredients for agricultural waste of which the availability is quite a lot and the price is relatively cheap. Inexpensive forages are usually used ranging from common grass, vegetable wastes like water spinach, carrot leaf, cabbage etc [4].

The spinach waste which is not suitable for human consumption might also become alternative feed material for

rabbits. This spinach waste is in the form of stems, some roots and leaves that are not consumed by humans. Rabbits are very fond of water spinach waste; usually given in fresh conditions.

Water spinach leaves have a dry matter (DM) content of 10.8%; Crude Protein (CP) 36.3%; Neutral Detergent Fiber (NDF) 40.2% and ADF 24.2% [4]. The nutritional content of water spinach with a ratio of leaves (28.3%) and stems (71.7%), the nutritional content of dry matter leaves 11.6%, crude protein 27.8% and crude fiber 7.30%. The stem contains 7.34% dry matter, 11.4% crude protein and 19.1% crude fiber [5]. From nutrition content, water spinach waste has very potential if it is used as rabbit feed.

Water spinach waste can be fed to growing rabbits as roughage and can be given as rabbit feed [5], [6]. Giving fresh form of water spinach waste to rabbits directly, is less efficient because if it is not consumed immediately. Water spinach will spoil easily. It had a high water content [6], and easily to decay; it is recommended that the water spinach be dried or made flour to make it more durable.

In addition, the presence of anti-nutritional substances in water spinach needs to be formed in pellets with other feed ingredients. Feeding rabbits for practical purposes, rabbits might be fed complete feed, usually in the form of pellets [4]. Feeding complete feed in the form of a pellet could overcome the problem of preference, so that rabbits could not select more preferable feed ingredients.

II. MATERIAL AND METHODS

The experiments used 40 males of New Zealand White rabbits. The rabbits were weaned at 30 days of age. The average rabbit weight was 1172.54 ± 109.09 g with a coefficient of variation 9.30%. This study used 4 treatments and 5 replications. Every cage was filled with two rabbits and considered as one experimental unit.

Feed treatments used consisted of:

T₀ : control feed;

T₁ : substitution with water spinach waste at 5%;

T₂ : substitution with water spinach waste at 10%; and

T₃ : the substitution with water spinach waste at 15%.

The controlled feed is made of several ingredients namely *Brachiaria decumbens* grass, corn, soybean meal, pollard, rice bran, corn gluten feed (CGF), corn pericarp, peanut shell meal, and Indigofera leaves. All feeds were formed into pellets before being fed. The composition of the control feed was presented in Table 1.

TABLE I. Ingredients and Chemical Composition

Ingredients	Treatment			
	T ₀	T ₁	T ₂	T ₃
Corn	12	12	12	12
Soybean meal	10	10	10.5	11
Peanut shell meal	6	6	4.5	10
Pollard	18	18	18	15
Rice bran	17	17	14	13
CGF	12	12	10	4
Corn pericarp	6.8	6.8	4.8	4.8
Indigofera leaf meal	10	7	7	7
Grass	10	8	8	4
Water spinach waste	0	5	10	15
Molasses	1	1	1	1
Vitamin and mineral mix	0.2	0.2	0.2	0.2
Chemical composition				
Dry matter (%)	83.22	84.36	84.35	92.02
Organic matter (%)	90.53	90.87	89.50	91.74
Crude protein (%)	15.78	15.44	15.16	15.82
Crude fat (%)	3.14	3.26	3.24	4.48
Crude fiber (%)	12.95	13.08	13.60	15.45

Source: Results of Analysis from Animal Nutrition Laboratory, Animal Husbandry Faculty, Brawijaya University

Feed was given with the frequency of daily feeding of 3 times, morning at 07.00 am, afternoon at 13.00, and late afternoon at 17.30 pm. The duration of the feeding study was conducted 6 weeks. The study variables measured were feed consumption, weight gain, and feed conversion in New Zealand White rabbits.

The variables observed were:

- Feed consumption:**
Feed consumption is the amount of food needed to provide nutrients for livestock to meet their genetic needs. Calculated by reducing feed feeding with residual feed.
- Body Weight Gain**
Body weight gain is measured from the difference in live weight at a certain end with the original live weight. The value of total body weight gain is calculated by subtracting the weight of the rabbit at the end from the initial weight.
- Feed Conversion**
The feed conversion ratio is measured from the ratio of the weight of feed consumed by livestock to the weight of production.

The data were then statistically analyzed by using Analysis of Variance; while the significant effect was then further tested by using Duncan's Multiple Range Test.

III. RESULTS AND DISCUSSIONS

The effect of water spinach waste on feed consumption, weight gain and feed conversion can be seen in Table 2.

TABLE II. Effect of Treatments on Feed Intake, Body Weight Gain and Feed Conversion Ratio

Treatments	Body weight Gain (g)**	Feed Intake (g)**	Feed Conversion Ratio*
T ₀	1141 ± 49 ^a	4090 ± 66 ^a	3.59 ± 0.10 ^{ab}
T ₁	1326 ± 41 ^b	4517 ± 91 ^c	3.52 ± 0.12 ^a
T ₂	1118 ± 71 ^a	4002 ± 120 ^a	3.59 ± 0.14 ^{ab}
T ₃	1147 ± 58 ^a	4308 ± 115 ^b	3.76 ± 0.10 ^b

Note: T₀=0% water spinach waste (wsw) ; T₁=5% wsw, T₂=10% wsw and T₃=15% wsw

* different superscript in the same column means significant effect (P<0.05), ** different superscript in the same column means highly significant effect (P<0.01)

The use of water spinach waste shows a significant increase in feed consumption (P<0.01). The highest feed consumption was obtained in the treatment of using water spinach waste 5% (T₁). The feed consumption then decreased with the increased use of water spinach waste by more than 5%. Basically rabbits like feed in the form of vegetables such as water spinach. According to the results of the feeding used water spinach higher than 50% treatment with 50% concentrate increased performances in rabbits [7].

In this study, the increase in the level of water spinach waste in feed by more than 5%, leads to a decrease in feed consumption. The decrease in feed consumption at a higher level of water spinach waste addition might be due to the lower quality of water spinach due to its waste form, and improper application of pesticides in cultivating spinach in the farm that might negatively affect nutrient metabolism.

Domesticated animals, including rabbit, are sensitive to bitter, sweet and sour tastes [4]. Any taste that has consistency/familiarity with livestock, produces metabolic gains and will be favored. And the rabbits have quite a lot of taste buds. Rabbits have 17,000 taste buds and four pairs of salivary glands [1]. This might also relate to the use of high water spinach waste.

The use of water spinach waste shows significantly higher body weight gain found for rabbits in T₁, then followed by T₃. The high weight gain at T₁ was associated with the highest feed consumption of T₁. The production performance of rabbit which was supplemented with water spinach waste gave the highest daily body weight gain in supplementation 75% was reported by [4]. However, [7] reported that the use of 3% water spinach waste with commercial feed resulted the best performance.

The use of water spinach shows a significantly different effect (P<0.01) on the feed conversion ratio; T₁ indicated the best feed conversion ratio, though similar to T₀ and T₃. The use of water spinach waste in feed, was able to be converted into performance when a low level (5%) of water spinach waste is used. The use of water spinach waste in feed improves the feed conversion of rabbits and it can be used as a single [8], [3], [9]. Overall variables indicated that T₀ exerts the best body weight and feed conversion ratio, though it also needs the highest feed consumption.

IV. CONCLUSION

Water spinach waste can be used as rabbit feed up to 5% to improve growth performances, but higher level of feeding causes performances decline. It is suspected that this decrease might be due to low nutritional quality and the accumulation of pesticides present in water spinach waste.

V. REFERENCES

- Gidenne, T., F. Lebas, and L. Fortun-Lamothe, L. 2020. Feeding behaviour of rabbits. *Nutrition of the rabbit, Third edition*. CABI Publishing
- Blas, C. D., and Mateos, G. G. (2010). Feed formulation. In *Nutrition of the rabbit* (pp. 222-232). Wallingford UK: CABI.

- [3] Hue, K.T. and Preston, T.R., 2006. Effect of different sources of supplementary fibre on growth of rabbits fed a basal diet of fresh water spinach (*Ipomoea aquatica*). *Livestock Research for Rural Development*, 18(3).
- [4] Tistiana, H., Widodo, E., and Djunaidi, I. H. (2020, April). Effect of Pellet Size in Ration with or without *Indigofera* sp on New Zealand White Rabbit Performances. In *IOP Conference Series: Earth and Environmental Science* (Vol. 478, No. 1, p. 012048). IOP Publishing.
- [5] Samkol, P., 2009. Water spinach (*Ipomoea aquatica*) as a feed resource for growing rabbits. *Revista Computadorizada de Producción Porcina Volumen*, 16(2).
- [6] Nakkitset, S., Mikled, C. and Ledin, I., 2008. Effect of feeding head lettuce, water spinach, ruzi grass or *Mimosa pigra* on feed intake, digestibility and growth in rabbits. *Asian-Australasian Journal of Animal Sciences*, 21(8), pp.1171-1177.
- [7] Kindossi, J. M. E., Akogou, F. E., A and, O. H. I., Tchani, A. Y. B., Djibrila, F., & Hongb&et&e, F. (2021). Leafy feed supplementation, rabbit growth performance and meat quality: Case study of *Ipomoea aquatica*. *International Journal of Livestock Production*, 12(3), 140-153.
- [8] Dong, N.T.K., Van Thu, N., Ogle, B. and Preston, T.R., 2006. Effect of supplementation level of water spinach (*Ipomoea aquatica*) leaves in diets based on para grass (*Brachiaria mutica*) on intake, nutrient utilization, growth rate and economic returns of crossbred rabbits in the Mekong Delta of Vietnam. *Livestock Research for Rural Development*, 20(9).
- [9] Nguyen, T.K.D., 2016. A response of nutrient intake, digestibility and growth rate of rabbits (*Oryctolagus cuniculus*) fed water spinach or sweet potato vines with or without fiber supplement. *Can Tho University Journal of Science*, (03), pp.19-24.