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Effect of feeding Indukantham kashayam residues on growth performance and economics of production of weaned New Zealand White rabbits#

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Abstract

A study was conducted to examine the effect of inclusion of Indukantham kashayam residue on growth performance and economics of production of weaned New Zealand White rabbits. Eighteen weaned New Zealand White rabbits of four to six weeks age were selected from Rabbit Breeding Station, College of Veterinary and Animal Sciences, Mannuthy. The experimental animals were randomly divided into three groups of six animals each and one of the three dietary treatments T1 (control diet with 18 per cent CP and 2700 kcal DE), T2 (Diet containing 5 per cent Indukantham kashayam residues) and T3 (Diet containing 10 per cent Indukantham kashayam residues) was alloted to each group. Data on weekly weight gain and daily feed intake were collected during course of study, while feed conversion ratio and economics of production were computed. The findings of the current study revealed that growth performance of weaned New Zealand White rabbits remained unaffected (p>0.05) among the dietary treatments. Indukantham kashayam residue can be included in the diet of growing rabbits up to 10 per cent level to reduce cost of production.

Keywords: *Indukantham kashayam residues, ayurvedic by product, rabbits, feed conversion ratio*

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Rabbit farming has currently attracted more attention because of the health and nutritional benefits of rabbit meat, namely its low cholesterol, fat and sodium content (Rajendran *et al*., 2020). Rabbits are mainly bred for meat, pelt and wool and also as pet animals (Ravindran and Subramanian, 2005). The benefits of raising rabbits compared to other livestock systems include their high prolificacy, quick growth rate, enhanced feed conversion efficiency, as well as their short gestation time. They have great potential to convert the given feed into quality products for human beings. Since rabbits are herbivores they can be fed with low grain, high forage diets so that they did not compete with humans for their food. However, one of the major threats associated with rabbit production is the scarcity of feed ingredients and their unpredictable availability.

Kerala is renowned for the variety of herbal medicines used in Ayurveda, and their residues after the extraction of the active ingredients from the medicinal plants are available in plenty. These ayurvedic by-products have good nutritional properties to be used as novel feed for animals. The use of these products could lower the production costs. Indukantham kashayam is a combination of herbs that have immunomodulatory effects as well as effects on gastric functions in human beings. Indukantham kashayam residue is one of the most available by-products from the nearby pharmaceuticals. Chemical analysis of Indukantham kashayam residues carried out in the Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala has shown that it is a good source of fibre and contains on an average 4 per cent crude protein. Hence, the present study was conducted to evaluate the effect of dietary inclusion of Indukantham kashayam residues in weaned New Zealand White rabbits on growth performance and economics of production.

Materials and methods

Location of study

The study was conducted at the Department of Animal Nutrition and Rabbit Breeding Station, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala, India.

Experimental animals, management and feeding

Eighteen weaned New Zealand White rabbits of four to six weeks were selected for the study from the Rabbit Breeding Station, Mannuthy. All the rabbits were randomly divided into three groups of six animals each and were allotted to one of the three dietary treatments (T1, T2, T3) following completely randomised design.

All the experimental animals were housed individually in metallic cages having facilities for feeding and watering. Concentrates were offered in the morning at 8.00 AM and roughages were given in the evening at 3.00 PM daily to each rabbit. The left over quantities of the feed and green grass were weighed daily and their moisture content was determined to calculate the dry matter intake. Clean drinking water was made available to all animals throughout the experiment. The animals were maintained under identical conditions of feeding and management throughout the experimental period of four months.

Three experimental diets were formulated with T1 (control diet with 18 per cent CP and 2700 kcal DE), T2 (diet containing 5 per cent Indukantham kashayam residues) and T3 (diet containing 10 per cent Indukantham kashayam residues). Ingredient compositions of diets fed to the three experimental groups are given in Table 1. All the diets fed were isocaloric and isonitrogenous with 18 per cent CP and 2700 kcal DE/kg diet (ICAR, 2013). Fresh good quality green grass was used *ad libitum* as roughage source.

Data collection

The daily feed intake and weekly body weight were recorded for all the rabbits throughout the experimental period. The price of ingredients used for the study was fixed as per rate contract fixed by Revolving Fund Feed mill, Department of Animal Nutrition, College of Veterinary and Animal Science, Mannuthy andIndukantham kashayam residues used for the experiment was procured free of cost from Kottakkal Arya Vaidhya Sala, Thrissur. The cost per kg gain was calculated from the data gathered.

Table 1. Ingredient composition of experimental diets, %

Ingredients	%		
	T1	T2	T3
Yellow maize	32	35	35
Gingelly oil cake	10	10	10
Soybean meal	4	4	4
Black gram husk	12	7	5
Wheat bran	15	10	5
Indukantham kashayam residues	-	5	10
Alfalfa	8	10	12
Rice polish	13	13	15
Deoiled rice bran	5	5	3
Salt	0.5	0.5	0.5
Calcite	0.25	0.25	0.25
Supplevite-M*	0.25	0.25	0.25
Total	100	100	100

*Supplevite-M (250 gram) contains 5,00,000 IU of Vitamin A, 1,00,000 IU of Vitamin D_3, 0.2 g of Vitamin B_2, 75 units of Vitamin E, 0.1 g of Vitamin K, 0.25 g of Calcium Panthothanate, 1 g of Nicotinamide, 0.6 g of Vitamin B_{12}, 15g of Choline chloride, 75 g of Calcium, 2.75 g of Manganese, 0.1 g of Iodine, 0.75 g of Iron, 1.5 g of Zinc, 0.2 g of Copper, 0.045 g of Cobalt.

Analysis of feed fodder and faecal samples

Proximate analysis of Indukantham kashayam residue, feed and green grass were done as per the standard procedures (AOAC, 2016). Minerals like calcium and phosphorus in the feed were analysed by conventional precipitation and titration method as per AOAC (2016).

Statistical analysis

Data obtained on the various parameters were analysed statistically as per Snedecor and Cochran (1994) by analysis of variance (ANOVA) technique, using the software Statistical Product and Service Solutions (SPSS) version 24.0.

Results and discussion

Chemical composition of Indukantham kashayam residues

The proximate composition of Indukantham kashayam residues is presented in Table 2. The result shows that Indukantham kashayam residues contain 97.99 per cent dry matter, 4.56 per cent crude protein, 52.82 per cent crude fibre, 2.68 per cent ether extract, 3.87 per cent total ash and 36.07 per cent nitrogen free extract.

Chemical composition of feed and fodder

The three experimental diets T1, T2 and T3 had 18.74, 18.90 and 19.20 per cent of crude protein respectively. Green grass used for the study contained 15.27 per cent dry matter, 9.43 per cent crude protein, 35.24 per cent crude fibre, 1.84 per cent ether extract, 10.40 per cent total ash, 43.09 per cent nitrogen free extract, 2.41 per cent acid insoluble ash, 0.54 per cent calcium and 0.33 per cent phosphorus. The proximate composition of fodder recorded in the study was similar with the results obtained by Jasmine (2017) and Seethal (2018). The per cent chemical composition of the experimental diets and fodder given to the rabbits are presented in Table 3.

Growth performance of rabbits fed diets with varying levels of Indukantham kashayam residues

The growth performance of New Zealand White rabbitsfed with two levels of Indukantham kashayam residues ispresented in Table 4 and the results reveal similar final weight and daily weight gain among all the treatment groups. Ashom and Luka (2018)

Table 2. Chemical composition[1] of Indukantham kashayam residues

Parameter	%
Dry matter	97.99 ± 0.21
Crude protein*	4.56 ± 0.02
Crude fibre*	52.82 ± 0.03
Ether extract*	2.68 ± 0.07
Total Ash*	3.87 ± 0.03
NFE*	36.07 ± 0.07
Acid insoluble ash*	1.35 ± 0.01

[1] Mean of three values
*On dry matter basis

reported that inclusion of baobab seed kernel meal at 0, 2.5, 5.0, 7.5 and 10.0 per cent in the diet of growing rabbits showed no significant difference in weight gain per day between groups. Similar data was reported by Hossian *et al*. (2020) for average daily weight gain on adding garlic leaf at 0, 5 and 10 per cent of the body weight in the diets of growing rabbits. The final weights recorded in this study was higher than those observed by Emmanuel and Ochefu (2020) who noted that inclusion of dried ginger (*Zingiber officinale*) root meal at 0, 15, 25 and 35 per cent in the diet of growing rabbits does not resulted in any significant variation in body weights of experimental animals between different treatment groups. On the contrary, Umar *et al*. (2021) observed that weaner rabbits fed diets containing 40 per cent replacement of palm kernel cake showed highest daily weight gain while the control diet recorded the least values.

The total dry matter intake and average daily feed intake reported in the study was similar (p>0.05) across treatment groups. Malik *et al*. (2020) reported that the inclusion of cowpea (*Vigna unguiculata*) milling waste at 0, 10, 20, 30 and 40 per cent in the diet of growing rabbits caused no significant differences in the total feed intake among the dietary treatments. Similarly, Sherif *et al*. (2018) noted that inclusion of carrot tops hay at 10, 20 and 30 per cent in the diet of growing rabbits showed similar results. On contrary, Shaahu *et al*. (2017) found that replacement of maize with 100 per cent composite cassava meal in growing rabbits caused a higher total feed intake of compared to the control diet. Since the incorporation of Indukantham kashayam residues at 5 and 10 per cent did not reduce feed consumption, similarities in feed intake indicate that all diets were well accepted by the rabbits.

Feed conversion ratio (FCR) in this study was 4.63, 4.18 and 4.46 for T1, T2 and T3 respectively. Similarly, Saleh and Bello (2015) found that rabbits fed diets replacing maize with mango seed kernel at 0, 33.33, 66.67 and 100 per cent level the FCR were 4.76, 4.64, 5.12 and 5.19 respectively without any difference between groups. Ashom and Luka (2018) also reported similar FCR between treatments with the inclusion of baobab seed kernel meal at 0, 2.5, 5.0, 7.5 and 10.0 per cent. Similar values (4.32 to 4.9) were observed by Khayyal *et al.* (2018) in growing rabbits fed with 0, 10, 20, 30 and 40 per cent of dried green bean vines in their diets.

Table 3. Chemical composition of feed and fodder[1], %

Parameters	Experimental feed			Fodder
	T1	T2	T3	
Dry matter	91.32 ± 0.27	91.75 ± 0.19	91.74 ± 0.23	15.27 ± 0.61
Crude protein*	18.74 ± 0.08	18.90 ± 0.06	19.20 ± 0.10	9.43 ± 0.10
Crude fibre*	8.31 ± 0.11	9.31 ± 0.09	11.31 ± 0.10	35.24 ± 0.05
Ether extract*	5.50 ± 0.11	5.49 ± 0.10	5.48 ± 0.09	1.84 ± 0.03
Total Ash*	6.47 ± 0.09	6.75 ± 0.04	6.96 ± 0.05	10.40 ± 0.07
Nitrogen free extract*	60.98 ± 0.17	59.55 ± 0.21	57.05 ± 0.16	43.09 ± 0.14
Acid insoluble ash*	1.02 ± 0.01	1.04 ± 0.01	1.13 ± 0.01	2.41 ± 0.04
Ca*	1.02 ± 0.04	1.05 ± 0.01	1.13 ± 0.02	0.54 ± 0.01
P*	1.00 ± 0.01	1.01 ± 0.03	1.03 ± 0.01	0.33 ± 0.04

[1]Mean of six values
*On dry matter basis

Table 4. Growth performance of rabbits fed diets with varying levels of Indukantham kashayam residues

Parameters	Dietary Treatments			p value
	T1	T2	T3	
Initial weight, kg	0.38 ± 0.02	0.39 ± 0.03	0.39 ± 0.01	0.99^{ns}
Final weight, kg	2.47 ± 0.06	2.60 ± 0.09	2.51 ± 0.11	0.571^{ns}
Average daily gain, g	17.52 ± 0.37	18.62 ± 0.75	17.88 ± 0.89	0.551^{ns}
Total body weight gain, kg	2.08 ± 0.04	2.22 ± 0.09	2.13 ± 0.11	0.551^{ns}
Total dry matter consumed (kg/animal)	9.64 ± 0.24	9.29 ± 0.25	9.49 ± 0.05	0.485^{ns}
Average daily dry matter consumed (g/ animal)	80.97 ± 1.99	78.18 ± 2.12	80.73 ± 1.35	0.515^{ns}
Feed conversion ratio	4.63 ± 0.11	4.18 ± 0.23	4.46 ± 0.18	0.292^{ns}

ns-non significant

Table 5. Cost per kg gain[1] of rabbits maintained on three experimental diets

Parameter	Treatments		
	T1	T2	T3
Total concentrate intake (kg/ animal) *	8.79 ± 0.24	8.46 ± 0.22	8.66 ± 0.16
Total grass intake (kg/ animal) *	11.45 ± 0.10	11.5 ± 0.16	11.68 ± 0.08
Concentrate cost (Rs./ kg)	32.96	32.29	31.81
Cost of grass (Rs./ kg)	4.95	4.95	4.95
Total cost of concentrate (Rs./ animal)	289.71 ± 7.93	273.17 ± 7.03	275.47 ± 5.19
Total cost of grass, (Rs./ animal)	56.72 ± 0.49	56.94 ± 0.81	57.82 ± 0.41
Total cost of feed, (Rs./ animal)	346.43 ± 8.31	330.11 ± 7.75	333.29 ± 5.31
Total weight gain (kg/ animal)	2.08 ± 0.04	2.22 ± 0.09	2.13 ± 0.11
Cost/kg gain (Rs.)	166.55 ± 4.42	148.70 ± 7.44	156.47 ± 6.17

*On fresh basis

[1] Mean of six values

Cost per kg gain

Cost of feed consumed per rabbit decreased with the inclusion of Indukantham kashayam residues (Table 5). Feed cost per kg weight gain was numerically lower in rabbits fed T2 diet followed by T3 diet, while the feed cost was higher for the control diet (T1). Ayuba *et al*. (2021) reported that on inclusion of sun-dried neem (*Azadirachta indica*) leaf meal at 15 and 20 per cent resulted in reduction in cost per kg gain compared to those fed control diet.

Conclusion

From the overall findings of the current study, it can be inferred that Indukantham kashayam residues at 10 per cent level can be safely incorporated in the diet of growing rabbits without any adverse effects on their growth performance. Further, it reduces the production costs associated with rabbit farming.

Conflict of interest

The authors declare that they have no conflict of interest.

References

AOAC [Association of Official Analytical Chemists]. 2016. *Official Methods of Analysis*. (20th Ed.). Association of Official Analytical Chemists, Washington DC, 1885p.

Ashom, S.A. and Luka, J.S. 2018. Growth response and serum biochemistry of growing rabbits fed graded levels of baobab (*Adansonia digitata*.) seed kernel meal. *Nigerian J. Anim. Sci*. **20**: 588-593.

Ayuba, F., Ayoade, J. A., Orayaga, K. and Emmanuel, S. S. 2021. Effect of feeding sun-dried neem (*Azadirachta indica*)

leaf meal on growth performance and economic of production of weaner rabbits. *Am. Res. J. Humanities Social Sci*. **4**: 40.

Emmanuel, B. and Ochefu, J. 2020. Effect of graded levels of dried ginger (*Zingiber officinale*) root meal on the performance and carcass parameters of growing rabbits. *Nigerian J. Anim. Sci*. **22**: 255-261.

Hossian, M.K., Ali, M.Y., Kamruzzaman, M. and Khan, M.J. 2020. Efficacy study of garlic leaf on feed utilization and growth performances of rabbits. *Acta Scientific Nutritional Hlth*. **4**: 8-11.

ICAR [Indian Council of Agricultural Research]. 2013. *Nutrient Requirement of Animals-Sheep, Goat and Rabbits* (3rd Ed.). Indian Council of Agricultural Research, New Delhi, 52p.

Jasmine, S.M.S. 2017. Effect of incorporation of spent rosemary (*Rosamarinus officinalis*) leaf meal as an ingredient in kid starter. *M.V.Sc thesis*, Kerala Veterinary and Animal Sciences University, Pookode, 53p

Khayyal, A.A., Morsy, W.A. and El-Deghadi, A.S. 2018. effect of feeding diets containing dried green bean (*Phaseolus Vulgaris*) vines on performance of growing apri rabbits. *Egyptian J. Nutri.Feeds.* **21**: 427-441.

Malik, A.A., Kudu, Y.S., Abdullahi, M. and Ibrahim, M.J. 2020. Growth performance and digestibility of nutrients by weaner rabbits (*Oryctolagus cuniculus*) fed diets containing varying levels of cowpea (*Vigna unguiculata*) milling waste. *Nig. J. Anim. Prod*. **47**: 149 – 154.

Rajendran, R., Prakash, S. and Selvan, S.T. 2020. Carcass characteristics of New Zealand White rabbits at market age. *Int. J. Curr. Microbiol. App. Sci*. **9**: 2720-2725.

Ravindran, R. and Subramanian, H. 2005. Prevalence of mite infestation in rabbits of Thrissur.*J. Vet. Anim. Sci.* **36:** 86-88.

Saleh, N. and Bello, K.M. 2015. Effects of replacing maize with mango seed kernel meal on performance, carcass characteristics and economic of production ofweaner rabbits. *Sci. J. Zoology*. **4**: 15-19.

Seethal, S.C.R. 2018. Effect of dietary incorporation of Dhanwantharam thailam residue on growth performance in crossbred calves. *M.V.Sc. thesis,* Kerala Veterinary and Animal Sciences University, Pookode, 84p.

Shaahu , D.T., Abacky, A. and Tiough, S.M. 2017. Effect of replacing maize with composite cassava meal (CCM) on growth and economics performance of rabbit. *Nigerian J. Anim. Prod*. **44**: 79-85.

Sherif, K. E., Rabie, M.H. and Bedair, A.I. 2018. Effect of feeding graded levels of carrot tops hay on growth performance of New Zealand White rabbits. *J. Anim. Poultry Prod*. **9**: 331-336.

Snedecor, G.W. and Cochran, W.G. 1994. *Statistical Methods*. (8th Ed.). The Iowa State University Press, Ames, USA, 503p.

Umar, M.M., Maigado, A.I., Ja'afar, A.M., Sadiq, M.S. and Shuaibu, A. 2021. Response of weaner rabbits fed graded levels of palm kernel cake (PKC) as replacement of wheat offal. *Nigerian J. Anim. Sci*. **23**: 151-159. ■