



Growth Performance, Nutrient Digestibility and Serum Biochemistry of Growing New Zealand White Rabbits Fed Graded Levels of Indukantham Kashayam Residues

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Abstract

The present study was conducted for 4 months to investigate the effects of feeding Indukantham kashayam residues (IKR) on growth performance, nutrient digestibility and serum biochemistry of growing rabbits. Three isonitrogenous and isocaloric diets were formulated incorporating IKR 0, 5 and 10 per cent levels. Eighteen New Zealand white growing rabbits were randomly distributed to three treatments, each replicated six times following completely randomised design and experimental animals were allotted to one of the treatment groups. Growth performance, digestibility coefficient of nutrients and serum biochemistry values for the experimental groups were similar between the treatment groups ($p > 0.05$). From the overall results of the study it can be concluded that IKR can be fed to grower rabbits up to 10.0 per cent of the diet without any deleterious effect on their growth performance and serum biochemistry.

Keywords: Indukantham Kashayam Residues; Digestibility; Serum Biochemistry; Rabbits

Introduction

Rabbits are prolific among meat producing animals with their short gestation length and have huge potential to address the animal protein requirement in developing countries. They can produce meat more quickly than most other livestock from fodder crop leftovers and agro-industrial by products [14].

Indukantham kashayam is a combination of medicinal herbs that have effects on human gastrointestinal and immunomodulatory functions. Indukantham kashayam residue is one of the ayurvedic by products with adequate amount of fibre and is readily available in plenty from many ayurvedic manufacturers. Preliminary chemical analysis of Indukantham kashayam residues has shown that it contains 4 per cent crude protein and is a rich source of fibre.

The rising cost of conventional feed ingredients has necessitated animal nutritionists to look for less expensive locally accessible

and nutritionally adequate alternative feedstuffs for livestock [10]. The nutrient profile of some of these non-conventional feedstuffs are comparable to that of some conventional feeding materials [2]. Utilization of these products may help in further reduction of production costs. Hence the present study was planned to evaluate the effect of dietary inclusion of Indukantham kashayam residues in growing rabbits on growth performance, nutrient utilisation and serum biochemistry.

Materials and Methods

The study was conducted at the Department of Animal Nutrition and Rabbit Breeding Station, CVAS, Mannuthy, Kerala, India. Eighteen New Zealand White rabbits of four to six weeks of age were selected from Rabbit Breeding Station, Mannuthy. The animals were maintained under uniform conditions prevailing in the farm. 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) using 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 of feed was determined to calculate the dry matter intake. Clean drinking water was made available to all animals throughout the experiment.

Three experimental diets were formulated viz., T1 (control diet with 18 per cent crude protein (CP) and 2700 kcal digestible energy (DE), T2 (Diet containing 5 per cent IKR) and T3 (Diet containing 10 per cent IKR). 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 [8]. Fresh good quality green grass was provided *ad libitum* as roughage source. The body weight of rabbits were taken at fortnight intervals to study the growth performance. Proximate analysis of Indukantham kashayam residue was done as per the standard procedures [3].

Digestibility trial was conducted during the last 3 days of feeding trial and the digestibility coefficients of the nutrients were determined. Throughout digestibility trial the animals were kept in special metabolism cages having facilities for feeding, watering and collection of faecal pellets, uncontaminated from feed residue or dirt. The faecal pellets dropped were collected in a netted device attached to the bottom of metabolism cages. The total faecal pellets voided during each day was weighed daily at 8.00 AM and were taken in air tight double lined polyethylene bags, labeled and stored in deep freezer for further analysis.

Weighed quantities of respective feeds were offered daily to each rabbit in the three treatment groups. Fresh water was provided *ad libitum*. During the digestion trial representative samples of feed and green grass offered were taken and stored for further chemical analysis. The remaining feed and grass samples were also collected from individual animals weighed and their moisture content was determined to calculate dry matter intake. From the data obtained on the intake and outgo of different nutrients during the digestion trial, digestibility coefficient of nutrients were calculated.

Blood samples were collected at the time of slaughter and serum was separated after centrifugation at 3000 rpm for 10 minutes for estimation of total protein [11], plasma cholesterol [13], HDL cholesterol [7], phosphorus [4], calcium [5], alanine aminotransferase (ALT), aspartate aminotransferase (AST), blood urea nitro-

gen (modified Berthelot method) and serum creatinine by using Semi Automated Blood Analyser. The standard biochemical kits used for these assays were purchased from Agappe Diagnostics Limited, Ernakulam, Kerala.

Data obtained on the various parameters were analysed statistically [15] by analysis of variance (ANOVA) technique, using the software Statistical Product and Service Solutions (SPSS) version 24.0.

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

Table 1: Ingredient composition of experimental diets, %.

*Supplevite-M (250 gram) contains 5,00,000 IU of Vitamin A, 1,00,000 IU of Vitamin D₃, 0.2g of Vitamin B₂, 75 units of Vitamin E, 0.1g of Vitamin K, 0.25g of Calcium Panthothanate, 1g of Nicotinamide, 0.6g of Vitamin B₁₂, 15g of Choline chloride, 75g of Calcium, 2.75 g of Manganese, 0.1g of Iodine, 0.75g of Iron, 1.5g of Zinc, 0.2g of Copper, 0.045g of Cobalt.

Results and Discussion

The proximate analysis of Indukantham kashayam residues showed that it contain 4.56% crude protein, 52.82% crude fibre and 2.67% crude fat.

The body weights of rabbits taken at fortnight intervals are given in (Table 2) and were similar between treatments groups. On a similar study, Emmanuel and Ochefu (2020) observed that inclusion of dried ginger (*Zingiber officinale*) root meal in the diet of growing rabbits at varying levels does not resulted in any significant variation in body weights among different treatment groups [6].

Fortnights	Dietary treatments			p value
	T1	T2	T3	
0	0.38 ± 0.02	0.39 ± 0.03	0.39 ± 0.01	0.99 ^{ns}
1	0.54 ± 0.04	0.54 ± 0.03	0.56 ± 0.01	0.75 ^{ns}
2	0.78 ± 0.04	0.72 ± 0.05	0.75 ± 0.03	0.48 ^{ns}
3	1.02 ± 0.06	0.94 ± 0.06	1.00 ± 0.05	0.57 ^{ns}
4	1.38 ± 0.07	1.28 ± 0.06	1.33 ± 0.05	0.53 ^{ns}
5	1.67 ± 0.06	1.65 ± 0.05	1.66 ± 0.05	0.97 ^{ns}
6	1.95 ± 0.06	1.97 ± 0.06	1.96 ± 0.07	0.98 ^{ns}
7	2.16 ± 0.05	2.22 ± 0.07	2.15 ± 0.07	0.74 ^{ns}
8	2.38 ± 0.05	2.47 ± 0.08	2.40 ± 0.10	0.70 ^{ns}

Table 2: Body weights of rabbits¹ taken at fortnight intervals.
ns: Non-Significant, ¹Mean of six values

Nutrient digestibilities of the three different diets (Table 3) were similar among the treatment groups. Similar digestibility coefficients were obtained by Khayyal, *et al.* (2018) for diets containing dried green bean vines at 0, 10, 20, 30 and 40 per cent respectively, when fed to rabbits [12].

Parameter	Dietary Treatments			p value
	T1(0%IKR)	T2(5% IKR)	T3(10%IKR)	
Dry matter	63.17 ± 0.95	66.09 ± 1.27	65.27 ± 0.99	0.18 ^{ns}
Crude protein	68.04 ± 1.05	70.31 ± 1.16	69.78 ± 1.19	0.11 ^{ns}
Crude fibre	33.15 ± 2.08	38.75 ± 2.34	32.55 ± 1.79	0.36 ^{ns}
Ether extract	85.68 ± 0.73	83.49 ± 0.31	83.71 ± 1.02	0.10 ^{ns}
NFE	69.75 ± 0.82	72.64 ± 1.45	74.37 ± 1.33	0.052 ^{ns}

Table 3: Effect of Indukantham kashayam residues on digestibility coefficients of nutrients¹, %.
ns: Non-Significant
¹Digestibility determined from pooled faeces (n = 6 per treatment).

Result of serum biochemical indices are shown in Table 4. All the serum biochemical parameters were similar among the treatment groups and were within the normal range reported for the species. Similar results were obtained for total protein, albumin, ALT and AST by Alagbe (2018) when rabbits were fed with diets containing watermelon rinds at 0, 4, 8, and 12 percent inclusion levels [1]. Jamsheera (2015) recorded similar values for calcium and phosphorus in broiler rabbits [9]. Sun, *et al.* (2017) reported that when rabbits were fed diets containing *Moringa oleifera* leaves at 0, 10, 20 and 30 per cent levels showed similar values for BUN and HDL cholesterol [16]. Wafar, *et al.* (2019) also reported that on inclusion of toasted African locust bean replacing full fat soyabean

at 0, 25, 50, 75 and 100 per cent levels in the diet of growing rabbit resulted in similar values for serum cholesterol and urea [17].

Parameters	Treatments			p value
	T1	T2	T3	
Total protein (g/dL)	6.46 ± 0.07	6.39 ± 0.13	6.37 ± 0.12	0.849 ^{ns}
Serum cholesterol (mg/dL)	56.25 ± 6.64	57.50 ± 4.56	56.25 ± 1.68	0.977 ^{ns}
HDL cholesterol (mg/dL)	30.65 ± 0.03	31.00 ± 0.22	30.75 ± 0.07	0.196 ^{ns}
Calcium (mg/dL)	11.18 ± 0.09	11.19 ± 0.04	11.32 ± 0.04	0.221 ^{ns}
Phosphorus (mg/dL)	4.86 ± 0.18	4.75 ± 0.17	4.81 ± 0.15	0.89 ^{ns}
AST(U/L)	76.20 ± 0.86	77.94 ± 0.74	78.82 ± 0.54	0.061 ^{ns}
ALT (U/L)	49.59 ± 0.73	50.60 ± 0.64	50.90 ± 0.54	0.34 ^{ns}
BUN (mg/dL)	23.21 ± 0.77	23.01 ± 0.94	22.82 ± 0.84	0.949 ^{ns}
Serum Creatinine(mg/dL)	1.33 ± 0.02	1.39 ± 0.02	1.35 ± 0.01	0.079 ^{ns}
Albumin(g/dL)	3.20 ± 0.04	3.23 ± 0.04	3.26 ± 0.04	0.628 ^{ns}

Table 4: Serum biochemical parameters of rabbits¹ maintained on three dietary treatments.
ns: Non-Significant
¹Mean of six values

Conclusion

From the overall findings of the present study, it could be inferred that Indukantham kashayam residues can be incorporated in diet of growing rabbits up to 10 per cent without having any adverse effects on the growth performance, nutrient digestibility and blood biochemical parameters.

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