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Research Article

Journal of Veterinary and Animal Sciences
ISSN (Print): 0971-0701, (Online): 2582-0605
https://doi.org/10.51966/jvas.2025.56.1.141-145

Effect of dietary incorporation of Ajamamsa rasayanam residue on serum biochemical parameters and body score of adult dogs under maintenance#

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Citation: Irishikesh, K., Mathew, J. J., Ally, K., Dipu, M.T., Sahib, L., George, S. 2024. Effect of dietary incorporation of ajamamsa rasayanam residue on serum biochemical parameters and body score of adult dogs under maintenance *J. Vet. Anim. Sci.* **56** (1):141-145

Received: 01.10.2024 Accepted: 12.12.2024 Published: 31.03.2025

Abstract

Four healthy adult dogs, aged one to four years and body weight of 11 to 13 kg, were selected for the experiment. The experiment was conducted in a switch-over design at the animal nutrition production (ANP) shed, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy, Thrissur. The study comprises four dietary treatments that included a control diet with chicken as animal protein and T1, T2 and T3 diets where 25, 50, and 100 per cent of the chicken protein was replaced on protein basis with Ajamamsa rasayanam residue. All diets were isocaloric and isonitrogenous with 18 per cent crude protein and 3500 kcal/kg feed. Feeding was done as per NRC (2006) guidelines for adult dog maintenance. An adaptation period of one week was given before the first and between treatment diets to nullify the carryover effect while switching between diets. Subsequent diet was provided during such periods for total experimental period of four months. Weekly body condition score was recorded throughout the feeding trial. Blood samples were collected from all the animals at the start and end of each feeding trial and observed that body condition score and serum biochemical parameters like glucose, total protein, albumin, blood urea nitrogen, creatinine, alkaline phosphatase, alanine transaminase and aspartate transaminase were within the normal range and similar (P>0.05) in all treatment groups. Statistical analysis of data has shown no significant difference in blood biochemical parameters and body condition scores among treatment groups suggesting that chicken meat can be replaced up to 100 per cent with Ajamamsa rasayanam residue in adult dog kept under maintenance diet.

Keywords: *Switch over, body condition score, serum biochemical parameters, health, maintenance, byproduct.*

Pet population is increasing worldwide and has predicted to reach over 51 million by 2028 from 33 million in 2023 (Statista, 2024). Consequently, pet food industry is also growing at a faster rate (Abinaya *et al*., 2020). Protein is the costliest macronutrient, both economically and ecologically (Swanson *et al*., 2013). Pet food production has increased more quickly than supply of animal-based protein, potentially leading to future shortages of protein ingredients (Gibbons, 2021; USDA 2022). The pet food industry has conventionally relied on protein sources such as chicken, meat

#Part of M.V,Sc thesis submitted to Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala

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and bone meals, poultry by-product meals and soyabean meals (AAFCO, 2003). Chicken is the commonly used animal protein source to formulate pet diets but being a key component in human diets, its inclusion in pet food results in direct competition with human food chain. The use of alternative protein sources has been studied in other animal species but only to a limited extent in companion animals. Goat meat (chevon) is an alternate protein source that can be used in canine diets. Goat meat processing and product preparation is seldom in India because of the high demand for raw meat. Further, only limited exploitation of these products has been attempted commercially for pharmaceutical and industrial use has been attempted (Rao *et al*., 1985). According to Ayurveda, goat meat is similar to human body tissues and it does not cause any imbalance in the body (Anon., 2024). Ajamamsa rasayanam is an ayurvedic medicine widely produced and used in Kerala, made using goat meat and over thirty herbs, cooked in a controlled temperature with ghee, honey, sugar and jaggery. It is nutritious, flavorful and supports the overall improvement of body's condition (Wanjarkhedkar and Pathak, 2024). Goat meat is the key ingredient in the manufacture of the above medicine with meat extracted into the broth that leaves fibrous muscle parts and small bone pieces as residue. Such chevon residue is available widely as an industrial byproduct and can be dried and made available in bulk. The search for a viable replacement for chicken in diets of adult dogs kept under maintenance diets need to be explored. Hence the proposed study was taken up to evaluate the use of Ajamamsa rasayanam residue as a replacement for dried chicken meat on serum biochemical parameters and body condition scores of adult dogs kept under maintenance diets.

Materials and methods

Dried Ajamamsa rasayanam residue was procured from Kottakkal Arya Vaidyashala, Malappuram. The samples were analysed for proximate principles and heavy metals as per AOAC (2016). Samples of dried Ajamamsa rasayanam residue were found to contain 0.001, 0.15, 0.001, 2.90, 1.80 ppm of arsenic, cadmium, mercury, lead and chromium respectively and were below the levels recommended by FDA 2011.

Feeding was done as per NRC (2006) guidelines for adult dog maintenance. The control diet (C) was prepared by incorporating chicken meat as the animal protein source and experimental diets were prepared by incorporation of Ajamamsa rasayanam residue (on protein basis) replacing chicken meat at 25 (T1), 50 (T2), and 100 per cent levels (T3) in maintenance rations for adult dogs. All the rations were made iso-caloric and iso-nitrogenous (Table 1)

Table 1. Ingredient composition of experimental dog foods

Ingredients (kg)	Dietary treatments			
	C	T1	T2	T3
Wheat	27	27	27	27
Maize	14	14	14	14
Ragi	10	10	10	10
Soyabean meal	10	10	10	10
Chicken	7	5.27	3.50	-
Ajamaamsa rasayanam residue	-	1.80	3.62	7.25
Meat cum bone meal	6	6	5.88	6
Wheat bran	21	20.93	21	20.75
Rendered fat	4	4	4	4
Supplevit-M*	0.5	0.5	0.5	0.5
Vitamin supplement *	0.5	0.5	0.5	0.5
Total	100	100	100	100
Nutrient composition (Analysed)				
CP%	18.36±0.10	18.25±0.05	18.38±0.11	18.45±0.08
CF%	3.57±0.14	3.03±0.32	3.20±0.34	3.43±0.29
ME Kcal/kg (calculated)	3510.20	3516.30	3512.60	3518.37
Calcium (%)	1.81±0.02	1.90±0.02	1.84±0.02	1.77±0.08
Total phosphorus (%)	0.63±0.06	0.64±0.06	0.67±0.07	0.65±0.07

*Supplevit-M (250 gram) contains 15 g Choline chloride, 75 g of calcium, 2.75 g of Manganese, 0.1 g of Iodide, 0.75 g of Iron, 1.5 g of Zinc, 0.2 g of Copper, 0.045 g of Cobalt, 5,00,000 IU of vitamin A, 1,00,000 IU of vitaminD3, 0.2 g of vitamin B2, 75 units of vitamin E, 0.1 g of vitamin K, 0.25g of calcium panthothanate, 1 g of Nicotinamide, 0.6 g of Vitamin B12,.

*Vitamin supplement (1 kg) contains vitamin A- 25 MIU, vitamin D3 - 8 MIU, vitamin E - 16g, vitamin B3 - 26g, vitamin B5 - 16g, vitamin B2- 10g, vitamin K3 - 3g, vitamin B6 - 3g, vitamin B1 - 2g, vitamin B9 -0.5g, biotin - 0.05g, vitamin B12 - 0.016g

Four medium sized healthy adult dogs of non-descript breed were selected for the study. They were of two to four years of age and with a body weight ranging from 11-13 kg and were housed in well-ventilated and clean individual cages throughout the experiment. They were maintained under identical management conditions.

A feeding trial in switch over experiment design was conducted at the Animal Nutrition and Production (ANP) shed, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy for four months with each period lasting for 21 days. The body condition score (BCS) was evaluated weekly using five-point score (Lund *et al*., 2006) included in Table 2. Blood samples were collected at the beginning and end of each trial period. Biochemical parameters such as total protein, albumin (Bromocresol green method), creatinine (AOAC, 2016), blood urea nitrogen (modified Berthelot method), serum alkaline phosphatase, serum aspartate transaminase and serum alanine transaminase were analysed using standard kits. Data obtained on different parameters during experiment were subjected to statistical analysis (Snedecor and Cochran, 1994) using analysis of variance (ANOVA) using SPSS version 24.0

Table 2. Body condition score chart

Score	Specifications
1	Thin
2	Underweight
3	Ideal
4	Overweight
5	Obese

Results and discussion

The data on weekly body condition scores are documented in Table 3. The average initial body condition score of dogs receiving control, T1, T2, T3 were 2.80, 3.00, 3.25, 3.00, respectively and average body score data at

Table 3. Weekly body condition score[1] of the dogs maintained on the four experimental diets

Period (weeks)	Treatments				p-value
	Control	T1	T2	T3	
0	2.88±0.31	3.00±0.20	3.25±0.14	3.00±0.20	0.699^{ns}
1	3.00±0.20	3.00±0.20	3.25±0.14	3.00±0.20	0.702^{ns}
2	3.00±0.20	3.25±0.14	3.25±0.14	3.25±0.14	0.682^{ns}
3	3.13±0.24	3.25±0.14	3.25±0.14	3.25±0.14	0.983^{ns}

[1]Mean of four values with SE
ns- Non significant

Table 4. Serum biochemical parameters[1] of the experimental animals maintained on the four experimental rations at start and end of each trial

Variables	Period	Control	T1	T2	T3	p-value
Glucose (mg/dL)	Initial	96.14±2.23	93.96±1.03	95.79±0.76	96.78±1.17	0.575^{ns}
	Final	97.88±1.06	97.21±1.01	99.85±1.38	98.03±0.77	0.381^{ns}
Total protein (g/dL)	Initial	6.38±0.32	6.66±0.18	6.54±0.22	6.61±0.21	0.390^{ns}
	Final	6.93±0.31	6.85±0.14	6.97±0.11	6.88±0.15	0.952^{ns}
Albumin (g/dL)	Initial	2.95±0.10	3.01±0.05	2.96±0.10	2.98±0.06	0.761^{ns}
	Final	3.01±0.07	3.07±0.03	3.06±0.06	3.08±0.03	0.248^{ns}
BUN (mg/dL)	Initial	17.52±1.60	18.55±1.62	18.26±0.82	16.88±0.54	0.319^{ns}
	Final	19.45±1.62	20.13±1.92	20.02±0.74	20.04±1.07	0.350^{ns}
Creatinine (mg/dL)	Initial	0.93±0.06	0.96±0.07	0.99±0.03	0.96±0.03	0.500^{ns}
	Final	0.99±0.04	0.99±0.05	1.03±0.01	1.05±0.01	0.114^{ns}
ALP (IU/L)	Initial	62.27±1.10	63.00±1.61	63.14±1.63	62.91±1.82	0.988^{ns}
	Final	63.04±1.53	65.03±1.61	64.60±1.51	62.45±1.89	0.820^{ns}
ALT (IU/L)	Initial	42.06±2.15	42.78±1.84	41.18±0.83	42.65±1.67	0.593^{ns}
	Final	43.51±1.86	43.96±0.31	42.51±1.59	44.45±1.04	0.725^{ns}
AST (IU/L)	Initial	29.25±1.06	29.93±1.01	29.93±1.66	29.89±0.74	0.975^{ns}
	Final	30.24±1.49	31.60±0.80	30.42±0.87	31.39±1.44	0.835^{ns}

[1]Mean of four values with SE
ns- Non significant

the end of the trial were 3.13, 3.25, 3.25, 3.25, respectively. Initial and final body condition scores (BCS) remained consistent as inferred ideal for an adult maintenance feed for dogs in all four treatments of the present study and values were consistent with those previously reported (Abinaya, 2019; Prem, 2022). Madhusudhan *et al*. (2018) reported initial and final BCS values of 3.53 and 4.00 in German Shepherds that were fed commercial diets containing 3710 kcal/kg of feed.

Results of serum biochemical analysis are presented in Table 4 and values obtained for four treatments both at the start and end of each feeding trial were similar. All the estimated haemato-biochemical parameters recorded in the present study were in normal physiological levels suggested for dogs (Kaneko *et al*., 2008; Latimer, 2011). Results of the study were suggestive that the replacement of one source of protein with another did not affect the blood biochemical values if the protein quality were comparable. Similar results on blood parameters were obtained by Areerat *et al*. (2021) on replacing poultry meal in dog diets with house cricket meal. Menniti *et al*. (2014) also observed similar values for all blood biochemical parameters in dogs fed diets containing dried chicken and soybean meal.

Conclusion

From the results of present study, Ajamamsa rasayanam residue has the potential to retain body condition score and serum biochemical parameters in normal range like chicken meat. Hence, Ajamamsa rasayanam residue can replace up to 100 per cent level of chicken in adult dogs kept under a maintenance diet.

Acknowledgments

The authors are thankful to the Dean, College of Veterinary and Animal Sciences, Mannuthy for providing the facilities necessary to carry out the study.

Conflicts of interest

The authors declare that they have no conflict of interest.

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