International Journal of Veterinary Sciences and Animal Husbandry 2025; 10(9): 22-25

ISSN: 2456-2912
NAAS Rating (2025): 4.61
VET 2025; 10(9): 22-25

www.veterinarypaper.com
Received: 25-07-2025
Accepted: 28-08-2025

Dona Mary Eldhose
MVSc., Scholar, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Pookode, Wayanad, Kerala, India

K Jasmine Rani
Assistant Professor, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy, Kerala Veterinary and Animal Sciences University, Wayanad, Kerala, India

Biju Chacko
Associate Professor and Head, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala, India

S Senthil Murugan
Associate Professor and Head, Livestock Research Station, Thiruvazhumkunnu, Palakad, Kerala, India

Renuka Nayar
Prefessor and Head, Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Pookode, Wayanad, Kerala, India

MT Dipu
Professor and Head, Cattle Breeding Farm, Thumburmuzhy, Thrissur, Kerala, India

G Radhika
Professor, Department of Animal Genetics and Breeding, Mannuthy, Thrissur, Kerala, India

R Naveen
MVSc., Scholar, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Pookode, Wayanad, Kerala, India

Corresponding Author:
Dona Mary Eldhose
MVSc., Scholar, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Pookode, Wayanad, Kerala, India

Nutrient evaluation of dried spent grapes and its effect on gut parasites in crossbred calves

Dona Mary Eldhose, K Jasmine Rani, Biju Chacko, S Senthil Murugan, Renuka Nayar, MT Dipu, G Radhika and R Naveen

Abstract
The present study aimed at nutrient evaluation of dried spent grapes (DSG) and its effect on gastrointestinal parasites in crossbred calves. Spent grapes, a nutrient-rich by-product of the Ayurvedic drug Dhraksharishta, are used as an immune booster and digestive stimulant. Eighteen crossbred calves (4-6 months) were divided into three groups of six animals, based on similar body weight and age, and housed at the Cattle Breeding Farm, Thumburmuzhy. Before formulating the basal diet for each calf, the nutritional composition of all feed ingredients and dried spent grapes was determined using AOAC (2023) methods, while their phenolic content and *in vitro* DPPH antioxidant activity were also evaluated.
Over a 90-day feeding trial, the T_1 group was fed a basal diet, and the T_2 and T_3 groups were fed 5 per cent and 10 per cent DSG-incorporated basal diets, respectively. Faecal samples were collected every month and examined to measure the counts of eggs per gram (EPG) and oocysts per gram (OPG) in the faeces.
The analysis revealed that DSG contained 72.61% dry matter, 14.44% crude protein, and 16.54% crude fibre. Additionally, the total antioxidant activity, assessed by *in vitro* DPPH assay, showed 59.38% inhibition, while the total phenolic content was determined to be 98.72 mg GAE/g.
The monthly eggs per gram data indicated that calves were infected with *Strongyle* spp., *Trichuris* spp., *Moniezia* spp., and *Eimeria* spp. at various stages during the feeding trial. The level of infection was comparatively higher in the control group (T_1), while the T_2 group, supplemented with 5% dried spent grapes (DSG), showed moderate infection, and the T_3 group, receiving 10% DSG, showed the lowest rates of infection.
It can be concluded that dried spent grapes can be incorporated in calf starter without compromising growth performance, and as a natural anthelmintic against gut parasites.

Keywords: Spent grapes, parasite, antioxidant, crossbred calves

Introduction
The rising demand for livestock products, coupled with increasing human population and declining cultivable land, has led to a significant reduction of feed and fodder availability for animals (Beckman *et al*., 2025) [1]. Furthermore, natural calamities like floods and droughts exacerbate this issue, making it challenging to ensure optimal nutrition for livestock. The high cost of conventional feeds and the limited availability of nutritionally balanced options hinder the attainment of optimal growth and production in animals. To overcome these challenges, exploring non-conventional feed resources has become essential for sustainable and economical livestock farming.
The Ayurvedic pharmaceutical sector produces a huge amount of biodegradable waste during drug production (Abdulhameed *et al*., 2020) [2]. South Indian states like Kerala have been exploring these by-products as unconventional feed resources in livestock diets (Tripura *et al*., 2021; Purushothaman *et al*., 2018; Rani *et al*., 2016) [3-5]. Utilization of various spent waste materials can partially or wholly replace conventional feed resources, leading to sustainable livestock production.
Spent grapes, a nutrient-rich by-product of the Ayurvedic drug *Dhraksharishta*, which is used as an immune booster, digestive stimulant, and hematinic, have potential as a sustainable ingredient in animal feed. The condensed tannins in grapes also exhibit anthelmintic properties, aiding in parasite management in livestock (Cash, 2016) [6].

Being rich in lipids, proteins, and carbohydrates, they serve as an excellent source of nutrition for animals. Therefore, this study aims to evaluate the *in vitro* DPPH radical scavenging activity, nutrient composition, and the effect of dietary supplementation with dried spent grapes (DSG) on gastrointestinal parasites in crossbred calves.

Materials and Methods

The study was conducted over a 90-day period at the Cattle Breeding Farm, Thumburmuzhy, with prior ethical approval from the Institutional Animal Ethics Committee. Eighteen female Frieswal calves, aged four to six months, were selected for the experiment. The calves were divided into three uniform groups of six animals each, balanced by body weight and age, and housed under consistent management conditions.

The groups were subjected to specific stall-feeding regimens with diets formulated to be isocaloric and isonitrogenous, in accordance with ICAR standards (ICAR, 2023) [7]. The T_1 group received a basal diet, while the T_2 and T_3 groups were supplemented with 5% and 10% dried spent grapes (DSG), respectively. All calves underwent a 14-day adaptation period prior to the trial, during which they were dewormed. Throughout the study, animals were provided with fresh green fodder *ad libitum*, a concentrate mixture of calf starter, and unrestricted access to clean drinking water.

Prior to diet formulation, the proximate composition of all feed ingredients and DSG was determined using AOAC (2023) [8] methods. The Ayurvedic by-product, DSG, was sourced from Oushadhi, Thrissur, and Kerala. Samples were sun-dried and ground for further analyses.

The *in vitro* DPPH radical scavenging activity of DSG was analyzed according to the method of Blois (1958) [9]. The antioxidant activity was expressed as percentage inhibition, calculated using the following equation:

$$\text{Percentage of inhibition} = [1-(AT/AC)] \times 100$$

The phenols were determined by slightly modified Folin and Ciocalteu method (Mallick and Singh, 1980) [10].

Faecal samples were collected at the end of every month in the morning directly from the rectum of all eighteen crossbred calves and examined to measure the counts of eggs per gram (EPG) and oocysts per gram (OPG) in the faeces. These samples were analyzed in the laboratory of Cattle Breeding Farm, Thumburmuzhy, by the Modified McMaster technique. The eggs and oocysts counted within the chambers were totaled and then multiplied by 100 to determine epg and opg values, respectively. The data obtained were statistically analyzed by one way ANOVA technique, using Statistical Package for Social Sciences (SPSS) version 24.0.

Results and Discussion

Nutritive value and chemical composition of dried spent grapes and Feed: The chemical composition and nutritive value of the experimental diets are presented in Table 1. The dried spent grapes used in the experiment contain dry matter, crude protein, and crude fibre 72.61%, 14.44%, and 16.54%, respectively. The three experimental rations T_1, T_2 and T_3 had 23.45, 24.45 and 24.55 per cent of crude protein, respectively, while the crude protein content of fodder used for feeding was 12.94 per cent on a dry matter basis. The proximate composition results of the dried spent grapes used in this study are comparable to those reported by Taşeri *et al*. (2023) [11] and Bugdaycı *et al.* (2024) [12]. Chemical analyses have revealed that the crude protein (CP) content in dried grape pomace varies between 6.12% (Tripura *et al*., 2021) [3] and 17.27% (Aghsaghali *et al*., 2011) [13]. Similar variations in crude fibre content have been observed. For instance, Tripura *et al*. (2021[3] reported 7.81 per cent crude fibre in spent grapes, while Bugdaycı *et al*. (2024) [12] reported 31.1% for dried grapes. The nutritional value of grape by-products is influenced by the specific techniques used during their processing, as well as potential variations related to the origin of the grapes themselves (Baumgärtel *et al*., 2007).[14]

Table 1: Chemical composition of feed, fodder and dried spent grapes fed to experimental calves

Nutrients (%)	T_1	T_2	T_3	Fodder	Dried spent grapes
Dry Matter	90.40±0.30	90.35±0.23	90.87±0.09	17.94±3.3	72.61±0.67
Organic Matter (OM)	91.42±0.23	91.59±0.17	91.84±0.09	90.16±0.15	92.85±0.18
Crude Protein	23.79±0.09	24.45±0.27	24.55±0.35	12.94±0.36	14.44±0.26
Crude Fibre	7.21±0.11	7.59±0.09	7.64±0.08	31.85±0.75	16.54±1.28
Ether Extract	3.64±0.07	3.69±0.06	3.56±0.07	1.68±0.14	1.79±0.03
Total Ash	8.57±0.23	8.40±0.17	8.15±0.09	9.83±0.15	7.14±0.17
Acid Insoluble Ash	0.55±0.02	0.72±0.01	0.89±0.02	2.72±0.10	2.64±0.04
Nitrogen free extract (NFE)	56.77±0.32	55.85±0.38	56.08±0.41	43.67±0.611	60.67±1.34
Phosphorus	0.66±0.03	0.67±0.01	0.68±0.02	0.31±0.04	0.56±0.01
Calcium	0.91±0.01	0.94±0.04	0.97±0.03	0.55±0.02	0.658±0.09
Neutral detergent fibre (NDF)	34.34±0.19	32.92±0.34	31.55±0.18	64.78±0.22	22.76±0.33
Acid detergent fibre (ADF)	20.72±0.16	19.47±0.26	18.25±0.54	39.18±0.31	19.02±0.03

Values from the second row onwards are expressed on DM basis, average of six values

The chemical composition of the experimental calf starters with varying levels of dried spent grapes (DSG) is as follows: the starters containing 0, 5 and 10 per cent DSG had DM contents of 90.40, 90.35, and 90.87 per cent, respectively. The CP levels were 23.79, 24.45, and 24.55, EE contents were 3.64, 3.69, and 3.56 per cent, CF contents were 7.21, 7.59, and 7.64 per cent, TA were 8.57, 8.40, and 8.15 per cent, NFE contents were 56.83, 55.85, and 56.08 per cent, respectively. Also, the calf starter had 34.34, 32.92 and 31.55 per cent NDF and 20.72, 19.47 and 18.25 per cent ADF, respectively. The findings on the proximate composition of calf starter in this study are consistent with studies reported by Rani *et al*. (2019) [15] and Chithrima (2018)) [16]. The green grass utilized in this research exhibited the following composition: 17.94% dry matter (DM), 12.94% crude protein (CP), 1.68% ether extract (EE), 31.85% crude fiber (CF), 9.83% total ash (TA), 2.72% acid-insoluble ash (AIA), 43.67% nitrogen-free extract (NFE), 64.78% neutral detergent fiber (NDF), 39.18% acid detergent fiber (ADF), 0.91% calcium, and 0.31% phosphorus. These results correspond well with those reported previously by Chithrima (2018)) [16] and Reddy *et al*. (2024)) [17].

In vitro DPPH activity and Total phenolic content in dried spent grapes

The total phenol and antioxidant activity of dried spent grapes is given in Table 2.

The total phenolic content in dried grapes was measured at 98 mg GAE/g, equivalent to 9.8% on a dry matter basis. This aligns with the results reported by Boonchu *et al.* (2015)). [18] and Zhao *et al.* (2018)). [19], emphasizing gallic acid as the major phenolic compound in the samples.

The DPPH inhibition per centage in DSG was found to be 59.38±0.74, consistent with Ghatak *et al.* (2014)). [20], who observed similar DPPH inhibition values in Indian grapes and also reported a positive correlation between phenolic content and antioxidant activity. Similarly, Baliyan *et al.* (2022)). [21] reported comparable results for Ficus religiosa, with a value of 43.41 per cent.

Table 2: Total phenol content and antioxidant activity of dried spent grapes

Parameter	Dried spent grapes	143-144
Total phenol (mg GAE/g)	98.72±0.57	145-146
DPPH (% of inhibition)	59.38±0.74	147-148

Average of six values with SE

Faecal egg count

The monthly egg per gram counts of gastrointestinal parasites in calves across the three experimental treatment groups throughout the feeding trial are detailed in Table 3. The monthly egg per gram data revealed that calves were infected with *Strongyle* spp, *Trichuris* spp, *Moniezia* spp, and *Eimeria* spp at different stages throughout the feeding trial. The highest level of infection was observed in the control group, whereas the T_2 group, supplemented with 5% dried spent grapes (DSG), showed a moderate infection level, and the T_3 group, containing 10% DSG, exhibited the lowest infection rates which can be due to the total phenolics present in the dried spent grapes. These results align with previous studies that have documented the anthelmintic effects of grape by-products (Mena *et al.*, 2025; Soares *et al.*, 2018) [22, 23]. Niezen *et al.* (1995)).[24] observed that sheep grazing on legume crops rich in tannins experienced a reduction in nematode burdens and a decrease in parasite egg counts in their feces, indicating that tannins may offer a natural protective effect against parasites in ruminants. Similarly, various other plant based anthelminthics is being widely used in ruminants. Kaiaty *et al*, (2021)) [25] reported that using pomegranate (*Punica granatum* L) peel extract in the diet of different ruminant species has resulted in 100% reduction in faecal egg count which can be due to polyphenols, bioactive substances present in this peel. Agro-industrial by-products containing tannin have also shown anthelmintic effects against gastrointestinal parasites in various species (Lecasble, 2012; Desrues, 2012) [26, 27].

Table 3: Monthly egg per gram of gastrointestinal parasites in calves of three experimental treatment groups*

Parasite Species	Group	First Month (EPG/OPG)	P-Value	Second Month (EPG/OPG)	P-Value	Third Month (EPG/OPG)	P-Value
Strongyle spp.	T_1	83.3±54.26	0.306	83.33±54.26	0.129	-	-
	T_2	50.00±34.15		-		-	
	T_3	-		-		-	
Trichuris spp.	T_1	16.66±16.66	0.391	-	-	-	-
	T_2	-		-		-	
	T_3	-		-		-	
Moniezia spp.	T_1	+	-	++	-	++++	-
	T_2	-		-		+	
	T_3	-		-		-	
Eimeria spp.	T_1	66.66±66.66	0.468	50.00±50.00	0.595	50.00±50.00	0.512
	T_2	66.66±33.33		33.33±33.33		16.66±16.66	
	T_3	-		-		-	

Tapeworm or coccidial eggs are present; they are scored as: ++++ = high; ++ = moderate; + = low numbers; - = absent; epg = eggs per gram of faeces, op = oocyst per gram of faeces

*Average of six values with SE

Acknowledgement

The authors are extending their gratitude to the ICAR-FPT scheme, Mannuthy, Kerala, India, for providing financial support and necessary facilities to carry out the study.

Conclusion

Over the past several decades, the management of these parasitic infections has primarily depended on the frequent administration of chemical anthelmintics. The antiparasitic effects of certain plants and agro-industrial byproducts have been linked to their diverse secondary metabolites. Thus, it can be concluded from the present study that inclusion of dried spent grapes at 10 % in the diet of crossbred calves have substantial effect on control of gut parasites and immune system. Therefore, incorporating DSG into calf starter diets presents a cost-effective option for farmers, enabling feed cost reductions without compromising calf growth and performance. This approach can enhance the overall economic viability of calf rearing operations.

Conflict of Interest

The authors declare that they have no conflict of interest.

Financial Support

Not available

Reference

1. Beckman J, Johnson ME, Ajewole K, Kaufman J, Sabala E. The growing demand for animal products and feed in India: Future prospects for production, trade, and technology innovation (Report No ERR-347). U.S. Department of Agriculture, Economic Research Service; 2025. https://doi.org/10.32747/2025.9015821.ers
2. Abdulhameed S, Surendran ON, Haridas M. Recycling and reuse of Ayurvedic pharma industry wastes. In: Valorisation of Agro-industrial Residues. Volume I: Biological Approaches. Cham: Springer International Publishing; 2020, p. 203-217.
3. Tripura S, Shyama K, Ally K, Ajith KS, Usha AP, Tarang M, *et al*. Incorporation of cooked barley residue

and spent grapes in the ration of pregnant Large White Yorkshire sows and their piglets. Trop Anim Health Prod. 2021;53:77. https://doi.org/10.1007/s11250-021-02863-4
4. Purushothaman S, Shyama K, Ally K, Dileep V, Anil KS, Joseph S. *In vitro* evaluation of Ayurvedic pharmaceutical by products as an alternate feed source. Indian J Nat Sci. 2018;8(49):14387-14393.
5. Rani K, Ally K, Seethal CR, Bunglavan SJ, Gangadevi P, Shyama K. Dietary incorporation of ksheerabala residue and its effect on nutrient utilisation, growth performance and blood biochemical parameters in crossbred calves. Indian J Anim Nutr. 2016;33(4):383-387.
6. Cash KA. The use of grape extract as a natural anthelmintic in small ruminants [Dissertation]. Lincoln University; 2016.
7. Indian Council of Agricultural Research. Nutrient requirements of animals-Cattle and buffalo. 3rd Ed. New Delhi: ICAR; 2023, p. 59.
8. AOAC. Official methods of analysis. 22nd Ed. Rockville (MD): Association of Official Analytical Chemists International; 2023, p. 188.
9. Blois MS. Antioxidant determination by the use of stable free radical. Nature. 1958;181:1199-1200.
10. Mallick CP, Singh MB. Plant enzymology and plant histo-enzymology. New Delhi: Kalyani Publishers; 1980.
11. Taşeri L, Gülcü M, Aktaş T. Comparison of grape pomace drying using a solar dryer and under open sun conditions. Viticult Stud. 2023;3:31-40.
12. Buğdaycı KE, Karagöz DM, Oğuz FK, Oğuz MN, Ulusan EÇ, Nacak A. Determination of feed value of chemically treated sun-dried grape pomace. Mediterr Vet J. 2024;9(2):270-276.
13. Aghsaghali AM, Maheri-Sis N, Mansouri H, Razeghi ME, Telli AS, Golshani AA. Estimation of the nutritive value of grape pomace for ruminants using gas production techniques. Afr J Biotechnol. 2011;10(33):6246-6250.
14. Baumgärtel T, Kluth K, Epperlein M, Rodehutscord M. A note on digestibility and energy value for sheep of different grape pomace. Small Rumin Res. 2007;67:302-306.
15. Rani KJ. Nutritional evaluation and effect of feeding hydroponic fodder maize on the haemato-biochemical parameters in cross-bred calves. J Vet Anim Sci. 2019;50(1):57-62. https://doi.org/10.51966/jvas.2019.50.1.57-62
16. Chithrima S. Effect of dietary incorporation of Dhanwantharam Thailam residue on growth performance in crossbred calves [Master's Thesis]. Thrissur: Kerala Veterinary and Animal Sciences University; 2018.
17. Reddy BO. Effect of feeding different levels of rumen undegradable protein on growth and economics of production in female crossbred calves. J Vet Anim Sci. 2024;55(1):83-87. https://doi.org/10.51966/jvas.2024.55.1.83-87
18. Boonchu T, Ang UN. Optimization of extraction and microencapsulation of bioactive compounds from red grape (*Vitis vinifera* L.) POMACE. J Food Sci Technol. 2015;52:783-792.
19. Zhao JX, Li Q, Zhang RX, Liu WZ, Ren YS, Zhang CX, Zhang JX. Effect of dietary grape pomace on growth performance, meat quality and antioxidant activity in ram lambs. Anim Feed Sci Technol. 2018;236:76-85. https://doi.org/10.1016/j.anifeedsci.2017.12.009
20. Ghatak AA, Chaturvedi PA, Desai NS. Indian grape wines: A potential source of phenols, polyphenols, and antioxidants. Int. J Food Prop. 2014;17(4):818-828. https://doi.org/10.1080/10942912.2012.741716
21. Baliyan S, Mukherjee R, Priyadarshini A, Vibhuti A, Gupta A, Pandey RP, Chang CM. Determination of antioxidants by DPPH radical scavenging activity and quantitative phytochemical analysis of *Ficus religiosa*. Molecules. 2022;27(4):1326. https://doi.org/10.3390/molecules27041326
22. Mena MO, Trevise GG, Silva TN, Moellmann VM, Bassetto CC, Gatti BS, *et al*. Evaluation of grape pomace supplementation in lamb diets to mitigate Haemonchus contortus infection. Agriculture. 2025;15(3):341. https://doi.org/10.3390/agriculture15030341
23. Soares SCS, Lima DGC, Laurentiz AC, Féboli A, Dos Anjos LA, Carlis DPMS, *et al*. In vitro anthelmintic activity of grape pomace extract against gastrointestinal nematodes of naturally infected sheep. Int J Vet Sci Med. 2018;6:243-247.
24. Niezen JH, Waghorn TS, Charleston WAG, Waghorn GC. Growth and gastrointestinal nematode parasitism in lambs grazing either lucerne (*Medicago sativa*) or Sulla (*Hedysarum coronarium*) which contains condensed tannins. J Agric Sci. 1995;125(2):281-289.
25. Kaiaty AM, Salib FA, El-Gameel SM, Hussien AM, Kamel MS. Anthelmintic activity of pomegranate peel extract (*Punica granatum*) and synthetic anthelmintics against gastrointestinal nematodes in cattle, sheep, goats, and buffalos: *in vivo* study. Parasitol Res. 2021;120(11):3883-3893.
26. Lecasble C. Le marc de café comme source atypique de tanins condensés dans le contrôle intégré des nématodes gastro-intestinaux chez les petits ruminants du Yucatán, Mexique [doctoral dissertation]. Maisons-Alfort: École vétérinaire de Maisons-Alfort; 2012.
27. Desrues O, Magana VJ, Girard M, Manolaraki F, Pardo E, Mathieu C, *et al*. Can hazelnut peels be used to control gastrointestinal nematodes in goats. In: 11th International Goat Association (IGA) Conference & 4th CAPARA Conference; 2012 Sep; p. 44.

How to Cite This Article
Eldhose DM, Rani KJ, Chacko B, Murugan SS, Nayar R, Dipu MT, *et al*. Nutrient evaluation of dried spent grapes and its effect on gut parasites in crossbred calves. International Journal of Veterinary Sciences and Animal Husbandry. 2025;10(9):22-25.