Journal of Scientific Research and Reports

Volume 30, Issue 11, Page 812-817, 2024; Article no.JSRR.125664
ISSN: 2320-0227

Effect of Feeding Ginger (*Zingiber officinale*) Powder on Nutrient Digestibility of Konkan Kanyal Kids

Dwij Sawant [a++*], A. J. Mayekar [a#], Vinay Patil [a++], N. N. Prasade [a†], S. S. Ramod [a‡], P. B. Bansode [b^], S. G. Shirsat [a##] and Shrenik Patil [c++]

[a] Department of Animal Husbandry and Dairy Science, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India.
[b] College of Agricultural Engineering and Technology, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India.
[c] Department of Agricultural Entomology, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jsrr/2024/v30i112608

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/125664

Original Research Article

Received: 07/09/2024
Accepted: 09/11/2024
Published: 15/11/2024

[++] *M.Sc. Agri.;*
[#] *Head of Department;*
[†] *Associate Professor;*
[‡] *Assistant Professor;*
[^] *Assistant Professor of Statistic;*
[##] *PhD;*
**Corresponding author: E-mail: dwijsawant16@gmail.com;*

Cite as: *Sawant, Dwij, A. J. Mayekar, Vinay Patil, N. N. Prasade, S. S. Ramod, P. B. Bansode, S. G. Shirsat, and Shrenik Patil. 2024. "Effect of Feeding Ginger (Zingiber Officinale) Powder on Nutrient Digestibility of Konkan Kanyal Kids". Journal of Scientific Research and Reports 30 (11):812-17. https://doi.org/10.9734/jsrr/2024/v30i112608.*

ABSTRACT

The present study aimed to determine the Effect of feeding Ginger (Zingiber officinale) powder on nutrient digestibility of Konkan Kanyal kids. antibiotics were commonly used in animal diets to promote growth. However, due to the search for alternative additives and restrictions in many countries on using antibiotics to increase feed value, feed expenses now make up a significant part of the total cost of goat production. An experimental trial was conducted to evaluate the effect of feeding Ginger (*Zingiber officinale*) powder on body weight of Konkan Kanyal kids. Twenty Konkan Kanyal kids were selected and classified in five treatments by using Randomized Block Design (RBD). Each treatment was subdivided into four replications. All the animals were fed with complete feed having mulato grass, jowar kadabi and concentrate mixture. In treatment T_1 no ginger powder was supplemented while in treatment T_2 3.0 g ginger powder, in treatment T_3 6.0 g ginger powder, in treatment T_4 9.0 g ginger powder and in treatment T_5 12.0 g ginger powder was supplemented. The duration of experimental trial was 90 days. The study showed that ginger inclusion in the diet improved digestibility thus12g ginger can be included in diet of konkankanyal kids for better performance. The crude protein (CP) digestibility indicated that the animals effectively utilized dietary protein. This could be attributed to certain phytochemicals in ginger, such as tannins and saponins, which help prevent protein degradation in the rumen, allowing for better digestion in the abomasum and small intestine.

Keywords: Ginger powder; Konkan Kanyal kids; nutrient digestibilty.

1. INTRODUCTION

In animal husbandry, feed plays a crucial role and has become a focus for improving animal performance. Numerous studies have explored how adding various feed additives can boost feed intake. In the past, antibiotics were commonly used in animal diets to promote growth. However, due to the search for alternative additives and restrictions in many countries on using antibiotics to increase feed value, feed expenses now make up a significant part of the total cost of goat production. The two primary objectives for increasing profitability on goat farms are to lower feed costs and to optimize the quality of animal products. In the Konkan region of Maharashtra, the Konkan Kanyal goat breed is highly recognized. Konkan Kanyal goats are raised for meat by small farmers and landless people in the Konkan region. The goat needs the right nutrition in order to increase its productivity. Supplementing goat feed with ginger powder encompasses various potential benefits for the animals and their owners (Duwa et al., 2020; Sa'aci et al., 2018; Ikyume et al., 2020). Ginger, known for its medicinal properties, could offer improved digestion, immunity and overall health for goats. Goat owners may try to lower their goat's risk of digestive problems like diarrhoea and bloating, strengthen their immune systems and even increase weight gain or milk production by adding ginger powder to their diet. Ginger is rich in essential micronutrients such as potassium, magnesium, copper, manganese and silicon. Potassium and manganese support disease resistance and help protect the heart, blood vessels and inner lining of the urinary tract. When used as a feed additive, ginger can help manage the rumen microbial population, decreasing rumen ciliated protozoa (fauna loss), reducing protein degradation and lowering methane production (Faniyi et al., 2016). Ginger saponins reduced gas production while increasing microbial protein levels with no impact on true digestibility (Srinivasan et al., 2003) Spices and flavors offer medicinal benefits when used as feed additives, acting as appetite and digestion stimulants, antimicrobial agents, anti-inflammatory agents, antioxidants and immune boosters in animals. Recently, modern physicians have increasingly utilized the rhizome of *Zingiber officinale* (ginger), which contains active compounds like gingerol, shogaols, gingerdiol and gingerdione, along with volatile oils that have medicinal properties. Ginger has demonstrated antioxidant, antiulcer, anti-inflammatory, anticancer, carminative, diaphoretic and gastroprotective effects. When used as a feed additive, *Z. officinale* has been shown to improve the health, performance and productivity of various farm animals.

2. METHODOLOGY

A growth trial of 90 days was conducted on 20 Konkan Kanyal goat kids of same average body weight and divided in five groups of four kids in each treatment which were selected randomly from the goat unit of the Instructional Livestock Farm of Department of Animal Husbandry and Dairy Science, College of Agriculture, Dapoli, to conduct the experiment. The goats were randomly assigned to five treatments comprising of four replications and each replication has one animal per replicate. The animals were raised in individual compartment under confinement. The experimental design used was the Randomized Block Design (RBD) with four goats per treatment.

2.1 Metabolism Trial

Twenty (20) konkankanyal kids from the feeding trial were used for metabolism trial. They were housed in individual metabolism cage with facilities for collection of feces and urine. Each buck was individually fed the same experimental diet used in the feeding trial to evaluate the digestibility of the diet. Samples for all the seven days period of collection in metabolic trial were preserved. At the end of collection period, the preserved faeces in the bottles were mixed properly and representative samples were used for chemical analysis.

2.2 Chemical Analysis

The faeces samples collected during the metabolic trial were analyzed for proximate principles, including dry matter, crude protein, crude fiber, ether extract, nitrogen-free extract, and total ash (AOAC, 1995).

2.3 Nutrient Digestibility

Nutrient digestibility was calculated by using following formula

$$\text{Nutrient digestibility } = \frac{(\text{Nutrient intake} - \text{ Nutrient outgo})}{\text{Nutrient outgo}} \times 100$$

2.4 Statistical Analysis

The collected data was analyzed by using statistical method know as 'Analysis of variance' (ANOVA) appropriate for the Randomized Block Design. The standard errors (SE) and critical differences (CD) at 5 per cent level of significance were worked out for comparison of treatments and presented in the respective tables (Snedecor & Cochran, 1994).

2.5 Treatment Details

T_1 (control): Basal diet without ginger powder, T_2: Basal diet + 3.0 g ginger powder, T_3: Basal diet + 6.0 g ginger powder, T_4: Basal diet + 9.0 g ginger powder, T_5: Basal diet + 12.0 g ginger powder. Ginger powder was given along with concentrate.

3. RESULTS AND DISCUSSION

Intake of nutrients in experimental kids on DM basis are explained on the basis of DM, CP, EE, CF, Ash and NEF. Dry matter intake (g/day) in T_1, T_2, T_3, T_4 and T_5was746.58, 763.95, 759.35, 736.30 and 731.23 respectively. CP intake (g/day) for T_1, T_2, T_3, T_4 and $T_5$was 144.85, 148.04, 146.96, 142.32 and 141.16 respectively. EE intake for T_1, T_2, T_3, T_4 and $T_5$was 27.26, 27.92, 27.78, 26.97 and 26.81 (g/day) respectively. Crude fiber intake for treatment T_1, T_2, T_3, T_4 and $T_5$was 261.34, 266.96, 264.91, 256.44 and 254.25 (g/day) respectively. Ash intake for T_1, T_2, T_3, T_4 and $T_5$was 106.31, 108.53, 107.62, 104.11 and 103.15 (g/day) respectively. NEF intake for treatment T_1, T_2, T_3, T_4 and $T_5$was 619.83, 634.11, 630.15, 610.88 and 606.54 (g/day).

The Dry matter outgo (g/day) in T_1, T_2, T_3, T_4 and T_5was139.25, 134.00, 129.50, 123.25 and 116.25 respectively. CP outgo for T_1, T_2, T_3, T_4 and $T_5$was 36.21, 34.78, 32.98, 31.28 and 30.35 respectively. EE outgo for T_1, T_2, T_3, T_4 and $T_5$was 10.57, 10.23, 9.85, 9.50 and 9.23 respectively. Crude fiber outgo for treatment T_1, T_2, T_3, T_4 and $T_5$was 56.00, 55.00, 51.93, 48.58 and 45.38 respectively. In T_1, T_2, T_3, T_4 and T_5ash outgo was31.05, 29.46, 27.28, 25.48 and 22.73 respectively. NEF outgo for treatment T_1, T_2, T_3, T_4 and $T_5$was 249.75, 242.75, 238.50, 225.75 and 218.25. Thus, the treatment T_1 had higher amount of outgo in DM, CP, EE, CF, Ash and NFE and lowest amount of outgo was observed in T_5.

Dry matter digested (g/day) in T_1, T_2, T_3, T_4 and T_5was607.33, 629.95, 629.85, 613.05 and 614.98 respectively. CP digested for T_1, T_2, T_3, T_4 and $T_5$was 108.65, 113.26, 113.98, 111.04 and 110.81 respectively. EE digested for T_1, T_2, T_3, T_4 and $T_5$was 16.69, 17.70, 17.93, 17.47 and 17.58 respectively. Crude fiber digested for treatment T_1, T_2, T_3, T_4 and $T_5$was 205.34, 211.96, 212.99, 207.86 and 208.87 respectively. Ash digested for T_1, T_2, T_3, T_4 and T_5was75.26, 76.60, 79.89, 82.11 and 85.89 respectively. NFE digested for treatment T_1, T_2, T_3, T_4 and $T_5$was 370.08, 391.36, 391.65, 385.13 and 388.29.

Table 1. Average intake of nutrients in experimental kids (DM basis)

Treatments	**Nutrients intake (g/d)**					
	DM	**CP**	**EE**	**CF**	**NFE**	**Ash**
T_1	746.58^{c}	144.85^{c}	27.26^{c}	261.34^{c}	619.83^{c}	106.31^{c}
T_2	763.95^{a}	148.04^{a}	27.92^{a}	266.96^{a}	634.11^{a}	108.53^{a}
T_3	759.35^{ab}	146.96^{b}	27.78^{ab}	264.91^{b}	630.15^{ab}	107.62^{b}
T_4	736.30^{d}	142.32^{cd}	26.97^{d}	256.44^{d}	610.88^{d}	104.11^{d}
T_5	731.23^{de}	141.16^{e}	26.81^{de}	254.25^{e}	606.54^{de}	103.15^{e}
SE ±	1.79	0.35	0.07	0.62	1.49	0.25
CD (5%)	5.52	1.07	0.20	1.93	4.58	0.78

Numbers having different superscripts differed from each other

Table 2. Average outgo of nutrients in experimental kids (DM basis)

Treatments	**Nutrients outgo (g/d)**					
	DM	**CP**	**EE**	**CF**	**NFE**	**Ash**
T_1	139.25^{a}	36.21	10.57^{a}	56.00^{a}	249.75^{a}	31.05^{a}
T_2	134.00^{b}	34.78	10.23^{ab}	55.00^{ab}	242.75^{b}	29.46^{b}
T_3	129.50^{c}	32.98	9.85^{c}	51.93^{c}	238.50^{bc}	27.28^{c}
T_4	123.25^{d}	31.28	9.50^{cd}	48.58^{d}	225.75^{d}	25.48^{d}
T_5	116.25^{e}	30.35	9.23^{e}	45.38^{e}	218.25^{e}	22.73^{e}
SE ±	1.06	1.59	0.15	0.65	1.88	0.41
CD (5%)	3.25	NS	0.46	2.01	5.79	1.26

Numbers having different superscripts differed from each other

Table 3. Average digested nutrients in experimental kids (DM basis)

Treatments	**Nutrients digested (g/d)**					
	DM	**CP**	**EE**	**CF**	**NFE**	**Ash**
T_1	607.33^{c}	108.65	16.69^{d}	205.34^{c}	370.08^{b}	75.26^{d}
T_2	629.95^{a}	113.26	17.70^{ab}	211.96^{a}	391.36^{a}	76.60^{d}
T_3	629.85^{a}	113.98	17.93^{a}	212.99^{a}	391.65^{a}	79.89^{c}
T_4	613.05^{b}	111.04	17.47^{c}	207.86^{b}	385.13^{a}	82.11^{b}
T_5	614.98^{b}	110.81	17.58^{ab}	208.87^{b}	388.29^{a}	85.89^{a}
SE ±	2.09	1.75	0.13	0.84	2.40	0.53
CD (5%)	6.43	NS	0.41	2.59	7.39	1.64

Numbers having different superscripts differed from each other

Table 4. Average nutrient digestibility in experimental kids (%DM basis)

Treatments	**Nutrients digestibility**					
	DM	**CP**	**EE**	**CF**	**NFE**	**ASH**
T_1	81.35^{e}	75.01^{b}	61.23^{c}	78.57^{e}	59.71^{e}	70.79^{e}
T_2	82.46^{d}	76.51^{a}	63.38^{b}	79.40^{d}	61.72^{d}	72.85^{d}
T_3	82.94^{bc}	77.56^{a}	64.55^{a}	80.40^{bc}	62.15^{bc}	74.65^{bc}
T_4	83.26^{b}	78.01^{a}	64.78^{a}	81.06^{b}	63.04^{b}	75.53^{b}
T_5	84.10^{a}	78.50^{a}	65.59^{a}	82.15^{a}	64.02^{a}	77.97^{a}
SE ±	0.15	0.98	0.51	0.25	0.32	0.40
CD (5%)	0.46	3.03	1.59	0.76	0.97	1.23

Numbers having different superscripts differed from each other

The average digestibility of DM observed in treatment T_1, T_2, T_3, $T_4$and$T_5$was 81.35, 82.46, 82.94, 83.26 and 84.10 per cent, respectively. The average digestibility of CP observed in present investigation was 75.01, 76.51, 77.56, 78.01 and 78.50 per cent in treatment T_1, T_2, T_3, $T_4$and T_5, respectively. The average digestibility of EE observed in treatment groups T_1, T_2, T_3,

$T_4$and T_5 was 61.23, 63.38, 64.55, 64.78 and 65.59 per cent, respectively. The average digestibility of CF observed was 78.57, 79.40, 80.40, 81.06 and 82.15 per cent in treatment T_1, T_2, T_3, $T_4$and T_5, respectively. The average digestibility of NFE observed in treatment T_1, T_2, T_3 ,$T_4$and T_5 was 59.71, 61.72, 62.15, 63.04 and 64.02 per cent, respectively. The average digestibility of ash observed in treatment T_1, T_2, T_3, $T_4$and T_5 was 70.79, 72.85, 74.65, 75.53 and 77.97per cent, respectively.

The results of this experiment are in agreement with the results of Ibrahim et al. (2022), who conducted study to evaluate the effect of inclusion levels of ginger on performance of Red Sokoto bucks (RSB) were he showed digestibility for DM at 0, 250, 500 and 750 g /100 kg was 80.14 ± 0.56, 81.94 ± 0.56, 81.27 ± 0.56, and 82.71 ± 0.56 respectively. Crude protein at 0, 250, 500 and 750 g /100 kg was77.02 ± 0.77, 78.32 ± 0.77, 77.27 ± 0.77 and 79.57 ± 0.77per cent, respectively. digestibility for Ether extract for 0, 250, 500 and 750 g /100 kg was61.71 ± 2.37, 67.00 ± 2.37 ,60.15 ± 2.37, and 67.53 ± 2.37 respectively. Ash for 0, 250, 500 and 750 g /100 kg was74.14 ± 0.86, 77.10 ± 0.86, 75.88 ± 0.86 and 78.43 ± 0.86 respectively.

Ginger supplements enhance saliva production, leading to greater secretion and activity of digestive enzymes. This improvement in the digestive process is achieved by increasing the population of cellulolytic bacteria (Ebeid et al., 2020).

The crude protein (CP) digestibility indicated that the animals effectively utilized dietary protein. This could be attributed to certain phytochemicals in ginger, such as tannins and saponins, which help prevent protein degradation in the rumen, allowing for better digestion in the abomasum and small intestine. This mechanism may also explain the higher digestibility observed for dry matter (DM), organic matter (OM), crude fiber (CF), crude protein (CP), ether extract (EE), ash, neutral detergent fiber (NDF), and acid detergent fiber (ADF). Additionally, CP intake and digestibility can influence the digestibility of other nutrients (Muhammad et al., 2011).

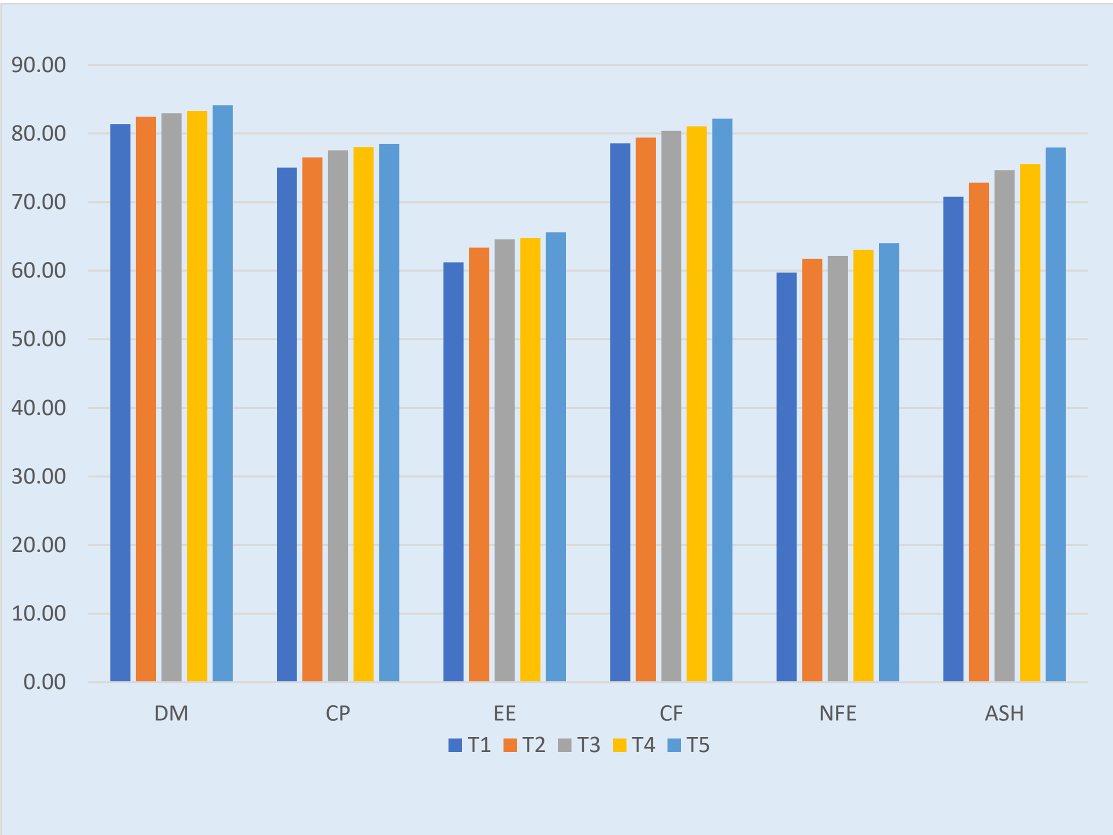

Fig. 1. Average nutrient digestibilty in experimental kids (% DM basis)

4. CONCLUSION

Ginger has demonstrated antioxidant, antiulcer, anti-inflammatory, anticancer, carminative, diaphoretic and gastroprotective effects. When used as a feed additive, Z. officinale has been shown to improve the health, performance and productivity of various farm animals. Based on the current investigation, it can be concluded that treatment group T_5, supplemented with 12 g of ginger powder, showed a significant increase in nutrient digestibility among the goat kids.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

A.O.A.C. (1995). *Official methods of analysis* (12th ed.). Association of Analytical Chemists, Washington, D.C.

Duwa, H., Amaza, I. B., Amaza, I. B., Dikko, M. I., Raymond, J. B., & Paullyne, U. O. (2020). Effect of ginger (*Zingiber officinale*) on the growth performance and nutrient digestibility of finisher broiler chickens in a semi-arid zone of Nigeria. *Nigerian Journal of Animal Science, 22*(3), 279–286.

Ebeid, H. M., Mengwei, L., Kholif, A. E., Hassan, F. U., Lijuan, P., Xin, L., & Chengjian, Y. (2020). *Moringa oleifera* oil modulates rumen microflora to mediate in vitro fermentation kinetics and methanogenesis in total mix rations. *Current Microbiology, 77*(6), 1271–1282.

Faniyi, T. O., Prates, Ê. R., Adewumi, M. K., & Bankole, T. (2016). Assessment of herbs and spices extracts/meal on rumen fermentation. *PUBVET, 10*(5), 427–438.

Ibrahim, U. M., Lakpini, C. A. M., Abdu, S. B., & Musa, A. (2022). Blood profile of Red Sokoto bucks fed ginger (*Zingiber officinale*) as feed additive of a *Digitaria smutsii* basal diet. *Nigerian Journal of Animal Science and Technology, 5*(4), 1–8.

Ikyume, T. T., Afele, T., Donkoh, D. S., Aloko, J. M., & Suleiman, U. (2020). Comparative effect of garlic (*Allium sativum*) and ginger (*Zingiber officinale*) and their combination on growth, rumen ecology, and apparent nutrient digestibility in sheep. *Nigerian Journal of Animal Production, 47*(5), 227–238.

Muhammad, N., Tukur, H. M., Maigandi, S. A., & Daneji, A. I. (2011). Performance and cost of production of fattening Uda sheep fed diets containing different energy levels in a semi-arid environment. *International Journal of Applied Agriculture and Apiculture Research, 7*(1), 79–85.

Sa'aci, Z. A., Alabi, O. J., Brown, D., & Ng'ambi, J. W. (2018). Effect of aqueous ginger (*Zingiber officinale*) extract on growth performance, nutrient digestibility, and economy of feed conversion of broiler chickens. *Animal Nutrition and Feed Technology, 18*(2), 225–231.

Snedecor, G. W., & Cochran, W. G. (1994). *Statistical methods* (8th ed.). Iowa State University Press, Ames.

Srinivasan, S., O'Fallon, L. R., & Dearry, A. (2003). Creating healthy communities, healthy homes, healthy people: Initiating a research agenda on the built environment and public health. *American Journal of Public Health, 93*(9), 1446–1450.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/125664