Effect of feeding Ginger (*Zingiber officinale*)powder on nutrient digestibility of Konkan Kanyal kids

Abstract:

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 improveddigestibility thus12g ginger can be included in diet of konkankanyal kids for better performance.

Key words: Ginger powder, Konkan Kanyal kids and Nutrient digestibilty.

Introduction:

In livestock farming, feed is a crucial element that has attracted particular focus to the animals in order to improve animal performance. Numerous studies have been done to determine how adding various feed enhancers can increase feed utilization. Antibiotics were frequently used in animal diets to promote growth. Due to the increased search for substitute feed additives, the use of antibiotics as a feed additive to increase the feed value is prohibited in many nations. A significant amount of the entire cost of producing goat is spent on feeding costs. The two main goals to raise the profitability of any goat farm are to lower the cost of feed and maximize 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. 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 contains many essential micronutrients, including potassium, magnesium, copper, manganese and silicon. Potassium and manganese promote disease resistance and protect the heart, blood vessels and urinary tract inner wall. Rumen microbial population can becontrolled by adding ginger as food additives to eliminate or reduce rumen ciliated protozoa(fauna loss), reduce protein degradation and methane production (Faniyi et al.2016).Ginger saponins decreased gas production, but increased microbial protein without

affecting true digestibility (Srinivasan et al., 2003) Spices and flavors are referred to have medical advantages like craving and processing energizers, anti-microbial activity, calming activity, hostile to oxidative activity and immunostimulant work on creatures when utilized as feed additive.In recent years, modern physicians have increased their usage of *Z. officinale* (ginger) rhizome. *Z. officinale* includes a number of active chemicals, including gingerol, shogaols, gingerdiol and gingerdione, as well as volatile oils, which are medically active ingredients. It has shown to have antioxidant and antiulcer, anti-inflammatory, anticancer, carminative, diaphoretic and gastroprotective properties. *Z. officinale* were used as feed additive to improve the health state, performance and productivity of many farm animals.

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.

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.

Chemical Analysis:

The samples of the faeces collected during metabolic trial were analyzed for the proximate principles *viz.*, Dry matter, Crude protein, Crude fibre, Ether extract, Nitrogen free extract and Total ash (AOAC, 1995).

Nutrient digestibility

Nutrient digestibility was calculated by using following formula

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

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.

Results and discussion:

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

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).

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

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.

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

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 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), whoconducted 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 supplementsincrease saliva secretion, which results in increasedsecretion and activity of digestive enzymes, therebyimproving the digestive process by increasing the numberof cellulolytic bacteria(Ebeid *et al.*, 2020).

The CP digestibility showed that dietary protein was properly utilized by the animals. This may be because some phytochemicals like tannins and saponins found in ginger prevent

protein degradation in the rumen so that it can be effectively digested in the abomasum and the small intestine. The same reason may be attributed to higher DM, OM, CF, CP, EE, Ash, NDF and ADF digestibility. This is because CP intake and digestibility can affect digestibility of other nutrients (Muhammad et al., 2011)

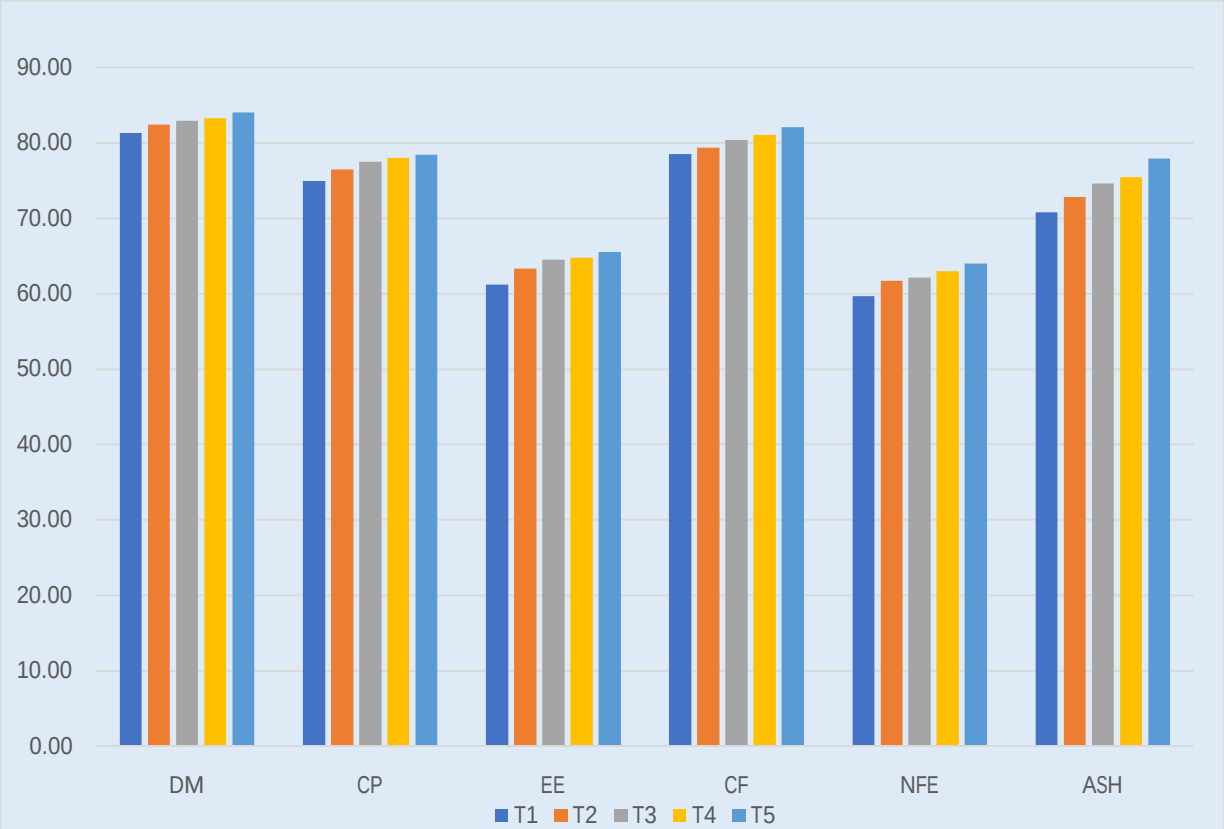

Fig 1: Average nutrient digestibilty in experimental kids (% DM basis)

Conclusion:

On the basis of the present investigation it may be concluded that, the significant increase in Nutrient Digestibilty was noticed in treatment T_5 kids supplemented with 12 g ginger powder.

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