



Effect of Dietary Inclusion of Garlic (*Allium Sativum*) on Feed Intake, Growth Performance and Feed Conversion Efficiency in Goat Kids

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ABSTRACT

Background: With the ban on the use of antibiotics as feed additives and growth promoters in animal nutrition, livestock scientists are now shifting their attention towards natural and safe products like organic acids, probiotics, prebiotics and herbal growth promoters. Plants containing essential compounds can be a cost-effective means of improving efficiency of nutrient utilization and growth performance of animals. The medicinal properties of garlic may have beneficial effects on nutrient utilization and health of animals. However, very few studies have been reported whereby garlic has been fed to ruminants. Therefore, the present study was designed to investigate the effect of dietary inclusion of garlic (*Allium sativum*) on feed intake, growth performance and feed conversion efficiency in goat kids.

Methods: Twelve kids of similar age were randomly allotted to two equal groups (n=6) on basis of body weight. All animals were maintained on common feeding regime consisting of required concentrate mixture and roughage as per requirement given by ICAR (2013). Kids in experimental group were supplemented with garlic @ 250 mg per kg body weight whereas; the control group was remaining unsupplemented. The study was conducted for 90 days. Animals were weighed fortnightly in the morning before offering feed and water. The data on growth rate in terms of body weight, average daily gain, feed intake and feed conversion efficiency were analysed as per standard procedures.

Result: The results indicated that overall mean body weight and average dry matter intake were statistically ($P>0.05$) similar in both the groups. No significant difference was observed in feed conversion efficiency between the treatment groups. The average daily gain was statistically similar in both the groups, but numerically 5.31 per cent increased ADG was observed in garlic fed group. From the results it can be deduced that the garlic supplementation improves average daily gain by 5.31%. However, it has no effect on feed intake and feed conversion efficiency of goat kids.

Key words: Feed intake, Garlic supplementation, Goat kids, Growth performance.

INTRODUCTION

Beneficial effects of herbs in farm animals may arise from the activation of feed intake and the secretion of digestive secretions, immune stimulation and antibacterial activity. Herbs can also contribute to the nutrient requirements of the animals; stimulate the endocrine system and intermediate nutrient metabolism. The ban on the use of synthetic antibiotics in feed has pushed animal nutritionists to use natural alternatives as growth promoters, such as prebiotics, probiotics, organic acids, herbs and several others. Garlic (*Allium sativum*), one of such natural alternative growth promoters, is used globally as a spice in human food preparation. Various reports have exposed that garlic is a good source of essential nutrients and beneficial phytochemical compounds that have ability to be incorporated in animal feed to enhance gut activity and promote growth performance in livestock and poultry. Research abounds that indicates that garlic phytochemicals have parasiticide, amoebicide, acarifuge, antifungal and immuno-stimulant effect in animals (Duke, 2002). Earlier studies on the effect of garlic supplementation on growth performance in animals have revealed inconsistency results. Bampidis *et al.* (2005)

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have reported no appreciable effect on growth of lambs fed with garlic bulbs, whereas, significant ($P<0.01$)

improvement in the overall feed intake, body weight gain and feed conversion efficiency in garlic supplemented calves was observed (Ahmed *et al.*, 2009; Duvvu *et al.*, 2018; Ghosh *et al.*, 2010; Balamurugan *et al.*, 2014). Keeping in view the various reports, this study was designed to assess the effect of garlic supplementation on feed intake, growth performance and feed conversion efficiency in goat kids.

MATERIALS AND METHODS

Location

The present study was conducted in Department of Animal Nutrition and goat sheds of College of Veterinary Science and A.H., Mhow (Madhya Pradesh). Permission for using the animals for the experiment was duly taken from Institutional Animal Ethics committee (IAEC) constituted as per CPCSEA rules laid down by Government of India.

Preparation of garlic powder

Fresh garlic was purchased from the local market and garlic powder was prepared by drying/ drying garlic under sun for 3 days and then ground to pass through a 4 mm sieve.

Animals and experimental design

Twelve goat kids of approximately similar age and body weight (14.06 ± 1.78) were selected and randomly allotted into two equal groups ($n=6$) on the basis of body weight. The kids were housed in goat shed, having facilities for individual feeding and watering. All kids were maintained on common feeding regime consisting of required concentrate mixture, gram straw and green as per requirement given by ICAR, (2013). The kids in group T_0 was not given any supplement (control). In addition to normal routine feeds and fodders, kids in groups T_1 was given garlic powder @ 250 mg/kg BW for 90 days. To determine the actual intake of nutrients by each calf, representative samples of concentrate and roughage were taken. Dry Matter of the samples was determined by keeping them in hot air oven for 24 hours at 100°C . All feed samples were analysed for proximate composition as per the standard procedures (AOAC, 2005). Chemical composition of experimental diet is given in (Table 1). The body weight of all the experimental animals was recorded at fortnightly intervals. Feed intake was calculated on dry matter basis. The difference in the total quantity of feed left over after 24-hours was taken to calculate the average feed intake. Feed conversion efficiency was calculated as per Banerjee (1998) *i.e.*, feed consumed (g)/body weight gain (g).

Statistical analysis

Data were subjected to statistical analysis using 't' test (Snedecor and Cochran, 1994). Independent 't' test was used to compare differences between groups and period means for different parameters by using SPSS 20.0 software.

RESULTS AND DISCUSSION

Effect of garlic supplementation on voluntary feed intake of experimental kids

Feeding garlic did not resulted in any significant change in voluntary dry matter intake, but numerically the treatment group consumed more than the control. Similar intake of dry matter (DM) is suggestive of no adverse effects of garlic supplementation on palatability in goat kids (Table 2). This is consistent with reports from Jagota *et al.* (2021) and Zhong *et al.* (2019) who reported that garlic supplementation did not affect dry matter intake in crossbred calves and lambs, respectively. Similar results were also reported by Rasoul *et al.* (2014) and Ikyume *et al.* (2017) in goats fed with garlic. However, Ghosh *et al.* (2010) observed significant increase in DMI in dairy calves fed with garlic.

Growth performance and feed conversion efficiency

No significant difference in body weight was observed between garlic supplemented and no supplemented kids from the first to sixth fortnight (Table 3). The average daily gain (grams) in body weight of experimental kids was statically similar ($P>0.05$) in both the groups but numerically 5.31 per cent higher weight was observed in garlic supplemented group in comparison to control group (Table 3). This improvement in the average daily gain might be due to the action of compounds like allicin and oregano-sulfur (Pourali *et al.*, 2010). Similarly, Ahmed *et al.* (2009) reported that addition of 2.5% natural juice containing garlic

Table 1: Chemical composition of feeds offered to goat kids (% DM basis).

Particulars	Concentrate mixture	Berseem fodder	Gram straw
Organic matter	88.37	86.52	92.66
Crude protein	19.21	13.61	5.6
Ether extract	2.43	1.30	1.42
Neutral detergent fibre	36.8	52.8	60.7
Acid detergent fibre	13.4	41.2	38.1
Crude fibre	11.60	24.94	38.32
Total ash (TA)	11.63	13.48	7.34
Calcium	0.85	1.39	1.14
Phosphorus	0.26	0.32	0.22

Table 2: Fortnightly average dry matter intake (g/d) of goat kids.

Attributes	T_0 (Control)	T_1 (Treatment)	P value
Initial	492 ± 12.25	496 ± 19.81	0.13
1 st fortnight	461 ± 6.80	485 ± 14.53	0.38
2 nd fortnight	475 ± 13.80	481 ± 20.63	0.17
3 rd fortnight	477 ± 15.97	498 ± 15.32	0.81
4 th fortnight	478 ± 9.46	504 ± 14.85	0.52
5 th fortnight	478 ± 4.78	522 ± 10.23	0.09
6 th fortnight	512 ± 7.68	549 ± 6.46	0.92
Avg. DMI (g/d)	482 ± 7.57	505 ± 12.42	0.09

Table 3: Fortnightly body weight (kg) changes and average daily gain (g/d) of goat kids.

Attributes	T ₀ (kg)	T ₁ (kg)	P value	ADG of T ₀ (g/d)	ADG of T ₁ (g/d)	P value
0 day	14.06±1.78	14.04±2.29	0.39	-	-	-
1 st fortnight	14.8±1.78	14.84±2.27	0.40	49.33±1.63	53.33±3.65	0.42
2 nd fortnight	15.5±1.78	15.58±2.28	0.40	46.67±2.11	49.33±1.63	0.76
3 rd fortnight	16.34±1.78	16.44±2.32	0.39	56.00±3.40	57.33±4.52	0.28
4 th fortnight	17.04±1.81	17.16±2.33	0.39	46.67±2.11	48.00±2.49	0.46
5 th fortnight	17.8±1.82	17.96±2.31	0.42	50.67±2.67	53.33±3.65	0.85
6 th fortnight	18.58±1.83	18.8±2.32	0.43	52.00±2.49	56.00±1.63	0.45
Average	16.30±1.80	16.40±2.30	0.40	50.22±1.47	52.89±0.90	0.69
Per cent increase in ADG				-	5.31%	

Table 4: Fortnightly feed conversion efficiency (FCE) of goat kids.

Attributes	T ₀ (Control)	T ₁ (Treatment)	Level of significance
1 st fortnight	9.39±0.25	9.28±0.74	0.09
2 nd fortnight	10.26±0.55	9.77±0.43	0.80
3 rd fortnight	8.63±0.60	8.82±0.48	0.85
4 th fortnight	10.31±0.39	10.59±0.49	0.58
5 th fortnight	9.53±0.43	9.98±0.74	0.27
6 th fortnight	9.94±0.51	9.85±0.36	0.63
Avg. FCE	9.62±0.28	9.55±0.24	0.90

significantly ($P<0.05$) increased the average daily gain in growing buffalo calves as compared to the control group. A higher average daily gain was also noted by Yan and Kim (2013) in pigs on supplementing with fermented garlic powder at the dose rate of 2 grams per kg of concentrate. However, garlic supplementation resulted in no positive influence on the average daily gain in growing lambs (Bampidis *et al.*, 2005). This is in agreement with the views of Ramakrishna *et al.* (2003) that garlic additive probably enhanced the activities of pancreatic enzymes and provided micro-environment for better utilization of nutrients.

Feed conversion efficiency

The feed conversion efficiency (Table 4) ranged from 8.63±0.60 to 10.31±0.39 for the kids of control group. While kids in garlic supplemented group ranged from 8.82±0.48 to 10.59±0.49. The feed conversion efficiency remained same in kids between both the groups. Statistical analysis revealed no difference in feed conversion efficiency between the treatment groups implying garlic supplementation has not influenced the feed conversion efficiency. In agreement of present results, Ikyume *et al.* (2017) reported that garlic powder supplementation up to 1.5% in concentrate diet did not exert any adverse effect on performance of WAD goats. Similarly, no positive influence on the feed conversion efficiency by garlic supplementation was reported by Bampidis *et al.* (2005) in growing lambs and Balamurugan *et al.* (2014) in crossbred calves. This result is in contrary with reports by Duvvu *et al.* (2018) who observed that a significant ($P<0.01$) improvement in the body weight gain, average daily gain, body condition score and feed

conversion efficiency in garlic supplemented buffalo calves compared to the control group. Similarly, Zivkovic *et al.* (2019) showed that the use of fermented garlic powder, instead of antibiotics, resulted in better gain and also better feed conversion ratio, in piglet. Strickland *et al.* (2009) also reported that inclusion of raw garlic in diet of Merino lambs aged 6 months decreased the rate of feed conversion.

CONCLUSION

The study was carried out to find the effect of garlic supplementation on feed intake, growth performance and feed conversion efficiency of goat kids. From the results it can be deduced that the garlic (*Allium sativum*) supplementation improves average daily gain by 5.31%. However, it has no effect on feed intake and feed conversion efficiency of goat kids.

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