

Growth Performance and Feed Intake of Goats Fed Garlic (*Allium sativum*) Supplemented Diets

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ABSTRACT

Two different experiments were conducted using fifteen growing lambs and fifteen fattening goats of Barbari breed with average weight of 17.4 and 21.1 kg and age of between 12 and 20 months respectively to evaluate supplemented garlic levels on performance of the animals. In each experiment, the animals were randomly assigned to three treatment diets containing graded garlic levels in a completely randomized experimental design replicated five times. Garlic was supplemented at graded levels of 30gm and 60gm for treatments T2 and T3 respectively while treatment T1 (control) had no garlic. Results indicated a significantly lower body weight gain for growing animals (experiment 1) fed diets containing garlic ($P < 0.05$) while feed conversion ratio (FCR) and cost of feed/kg live weight gain was higher. For fattening animals (experiment 2), garlic inclusion above 30gm had a negative effect on fattening performance ($P < 0.05$). It was concluded that inclusion of garlic in the diet of growing and fattening Barbari goat could not improve performance.

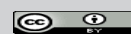
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Agriculture is the main driving force of her national economy where the components of agriculture are crop, livestock, fisheries and horticulture. Garlic (*Allium sativum*) has been a subject of considerable interest as a medicinal and therapeutic agent globally since ancient times. It was used as a remedy for intestinal disorders, flatulence, worms, respiratory infections, skin diseases, wounds, symptoms of ageing and many other ailments. Garlic as natural growth promoters having allicin, ajoene, dialkyl polysulphides, s-allylcysteine etc. (Canogullari *et al.* 2010) can alternate artificial growth promoters (Demir *et al.* 2003; Lanzotti, 2006; Toghyani *et al.* 2011). Spices such as garlic (*Allium sativum*) possess useful pharmacological potent chemical substances for use in animal nutrition to enhance the performance of livestock. Garlic is used as

natural additives to replace chemical additives to improve digestibility, nutritive value, and increase feed utilization, thus improve the performance of growing animals. Garlic extracts show anti-oxidation that consequently alleviates gastric mucosal damage. In addition to these attractive properties, herbs have been shown to increase feed palatability and thus feed intake (Horton *et al.* 1991). Because of the antimicrobial, antioxidant and flavour enhancing properties of garlic, these herbs may promote growth and feed utilization in goat. That will open the new dimension of the ban of antibiotic. Therefore, the

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present study is planned to evaluate performance of garlic supplemented feed on the performance of growing and fattening goat.

MATERIALS AND METHODS

Experimental location and climatic condition

The experiment was conducted at the village level organised dairy farm, village Ruheri district Hathras. Hathras is located at 27°36'N 78°03'E / 27.6°N 78.05°E. It has an average elevation of 185 metres (606 feet). The temperature here averages 25.4 °C. In a year, the rainfall is 755 mm.

Experimental design, feed sourcing and diet formulation

A complete randomized design (CRD) was used for the two experiments. Fifteen (15) experimental animals each were divided into three (3) dietary treatments replicated five times; each animal serving as replicate. The animals were balanced for weight at the start of the experiments. The Garlic was purchased from Hathras market together with other feed ingredients which includes Maize, Cowpea husk, Cotton seed cake, and Rice offal, Salt, and Mineral Mixture. Three diets were formulated for each study using supplemented Garlic levels. Diet 1 serves as control (without ginger inclusion) while Diets 2 and 3 were supplemented with garlic at the dose rate of 30 and 60 gm per kg body weight, respectively in their concentrate feed.

Table 1: Composition of Experimental Diets for Experiment 1

Ingredients	Treatments (garlic supplemented level gm)		
	1 (0)	2 (30gm)	3 (60gm)
Maize	25	25	25
Cowpea husk	12	12	12
Cotton seed cake (CSC)	20	20	20
Rice offal	12	12	12
Bajra	30	30	30
Salt	0.50	0.50	0.50
Min. Mix	0.50	0.50	0.50
Total	100	100	100

Calculated nutrient contents			
Crude Protein (%)	16.00	16.00	16.00
Energy (kcalME/kg)	2200	2200	2200
Crude Fibre (%)	20	20	20
Ginger supplementation (g)	0	30	60

The experimental diets were used to feed the 15 growing and the 15 fattening animals for 90 days. The diets were designated as diet 1, 2, and 3 in the experiments. Compositions of the experimental diets are shown in Table 1 and Table 2, respectively.

Table 2: Composition of Experimental Diets for Experiment 2

Ingredients	Treatments (supplemented garlic level (%))		
	1 (0)	2 (30gm)	3 (60gm)
Maize	35	35	35
Urd husk	16	16	16
Cotton seed cake	18	18	18
Bajra	28	28	28
Mineral mixture	2	2	2
Salt	1	1	1
Total	100	100	100
Calculated nutrient contents			
Calculated energy (ME Kcal/kg)	2600	2600	2600
Crude protein (%)	13	13	13
Calculated Fiber (%)	20	20	20
Ginger Supplementation (g)	0	30	60

Data collection

In each experiment, Feed and water intakes were calculated on daily basis. Feed intake was recorded by subtracting feed left over from quantity offered the previous day. Live weight changes were recorded on weekly basis after overnight fasting of the animals to avoid error due to gut fill.

RESULTS AND DISCUSSION

Proximate composition of the experimental diets

The dry matter content of experimental diet varied from 90.45 to 91.68 % (Table 3). Crude protein (CP)

content varies from 11.24 to 12.45%. Crude fiber (CF) content increased as the level of Garlic increased. Ether extract decreased from treatment 1 to treatment 3 as ginger level increased.

Table 3: Proximate composition of experimental diets for Experiment 1

Parameter (%)	Treatments (garlic supplemented level g)		
	1 (control)	2(30)	3 (60)
Dry matter (DM)	90.45	91.68	91.15
Crude protein (CP)	11.24	12.45	11.95
Crude fiber (CF)	22.47	26.86	28.13
Ether extract (EE)	5.95	5.32	4.51
Nitrogen free extract (NFE)	46.34	43.67	40.83

The Dry Matter (DM) content of the experimental diet increases as the level of garlic increased. Crude Protein content decreased slightly as the level of ginger increased. Ether Extract and NFE values decreased from treatment 1 to treatment 3. Crude Fibre content increased as the inclusion level of garlic increased (Table 4).

Table 4: Proximate compositions of the experimental diets for Experiment 2

Parameter (%)	Treatments (garlic supplemented level gm)		
	1 (Control)	2 (30gm)	3 (60gm)
Dry matter (%)	93.87	94.69	95.16
Crude protein (%)	13.18	12.73	12.45
Crude fibre (%)	22.89	24.95	29.70
Ether extracts (%)	6.48	5.79	4.95
NFE (%)	49.28	45.73	42.13

These results were supported by the findings of (Hassan *et al.* 2013) and (Alagawany *et al.* 2016) in growing buffalo calves and rabbits respectively. The additional energy available due to the essential oil from medicinal supplementation is used to improve performance and reduce body reserve losses (Tedeschi *et al.* 2003). However, (Tager and Krause 2011) reported that dry matter intake was not affected by EOs supplementation in the diet.

Performance of growing goat fed graded levels of Garlic

There is no significant difference ($p > 0.05$) in initial body weight of the growing animals (Table 5). Total live weight gain and average daily gain was higher ($p < 0.05$) for treatment 1 (control) compared to other treatments. Final weight, feed intake and dry matter as % body weight for treatments 1 and 2 are significantly higher ($p < 0.05$). Feed conversion ratio (FCR) is significantly higher ($p < 0.05$) for animals fed diet containing higher garlic levels (garlic treatment 3).

Table 5: Performance of growing goat (Experiment 1) fed varying levels of garlic

Parameters	Treatments (garlic supplemented level gm)			
	1 (0gm)	2 (30gm)	3 (60gm)	SEM
Initial body weight (kg)	18.90	18.40	17.50	1.33
Final body weight	26.10a	20.600ab	18.30b	2.45
Total live weight gain (kg)	8.60a	3.30b	1.90b	1.60
Average daily gain (kg)	127.00a	45.00b	39.00b	27.11
Feed intake (kg/day)	1.40 a	0.83b	0.61b	0.18
Total feed intake (kg)	1183.27a	815.34ab	650.83b	127.25
Feed conversion ratio	6.61c	7.28b	7.95 a	0.003
Dry matter intake as %body weight (DMI as %BW)	4.59a	3.05ab	2.75b	0.235

abc means in the same row with different superscripts are significantly different ($p < 0.05$).

Performance of fattening goat fed graded levels of Garlic

There is no difference ($P > 0.05$) between the treatments in initial weight, final weight and DMI as % BW. Treatments 1 and 2 has significantly higher total weight gain ($P < 0.05$) compared to treatment 3 (Table 6). There is no significant difference ($P > 0.05$) in feed intake between treatments 1 and 2.

Table 6: Feed intake, Feed conversion ratio and live weight gain of fattening goat fed graded levels of garlic

Parameters	Treatments			
	1(Control)	2(30)	3(60)	SEM
Initial weight (Kg)	22.30	21.20	23.50	3.10
Final weight (Kg)	34.40	31.70	31.10	2.84
Total weight gain (Kg)	12.95a	11.55a	8.50b	1.04
Average daily gain (Kg/day)	181.0a	160.0ab	122.0b	20.42
Feed intake (Kg/day)	2.68a	2.49a	2.18b	0.23
Feed conversion ratio	6.10b	5.84b	8.92a	0.92
DMI as %body weight	6.18	6.42	6.02	0.29

The present study was agreed with the study of (Onu and Aja 2011) who reported that final body weight was increased in garlic, ginger and mixture of garlic & ginger supplemented group compared to control group. The increased body weight was observed in this study strengthen the findings of (Ahmed and Sharma, 1997) and (Ademola *et al.* (2009) who found significant increase of body weight gain of broiler fed a mixture of Garlic and Ginger. (Aji *et al.* 2011) reported increase in weight gain of rabbits and broilers fed garlic supplemented diets respectively. This result of increasing body weight gain was differed with the finding of (Dieumou *et al.* 2009) who reported no effect of garlic and ginger supplementation on body weight gain of broiler. However, this observation contradicts the reports of (Omage *et al.* 2007), (Farinu *et al.* 2009), (Ademola *et al.* 2006) and (Horton *et al.* 1991).

Cost of growing goat fed graded levels of garlic

Table 7: Cost of feed and cost feed/kg live weight of growing goat fed graded garlic levels

Parameters	Treatments (garlic supplemented level gm)		
	1 (0gm)	2 (30gm)	3(60gm)
Total cost of feed consumed (₹)	3632.50a	2298.60b	2825.40b
Cost of feed/ kg live weight (₹)	110.80c	143.30b	271.10a

abc means in the same row with different superscripts are significantly different (p < 0.05).

There is no significant difference (P > 0.05) in Total cost of feed consumed between treatments 2 and 3 (Table 7). Cost of feed/kg live weight is significantly higher for animals fed higher garlic levels.

Cost of fattening Goat fed graded levels of garlic

There is no significant difference (P > 0.05) in Total cost of feed consumed between treatments 2 and 3 (Table 8). Cost of feed/kg live weight is significantly higher for animals fed higher garlic levels. The present results are in agreement with (Hossain *et al.* 2014) who also reported significantly higher BCR with 1% garlic than the control. Cost of feed per kg live weight gain is an important indicator of economics of sheep production (Maigandi *et al.* 2002).

Table 8: Cost of fattening Goat fed graded levels of garlic

Parameter	Treatments		
	1(Control)	2(30gm)	3(60gm)
Total cost of feed consumed(TCFC) (₹)	2852.30b	3595.60a	4031.90a
Cost of feed/kg live weight (₹/ kg)	95.206c	176.30b	308.40a

abc means in the same row with different superscripts are significantly different (p < 0.05).

CONCLUSION

The total cost of feed consumed is significantly higher (P< 0.05) for animals in treatment 1 compared to those in treatment 3. However, cost of feed/kg live weight kg was lower for the same group of animals (treatment 1).

REFERENCES

- Ademola, S.G., Farinu, G.O., and Babatunde, G.M. 2009. Serum lipid, growth and haematological parameters of broilers fed garlic, ginger and their mixtures. *World Journal of Agricultural Science*, **5**(1): 99-104.
- Ademola, S.G., Farinu, G.O., Obe, A.A., and Babatunde, G.M. 2006. Growth, haematological and biochemical studies on garlic-and ginger-fed broiler chickens. *Moor Journal of Agricultural Research*, **5**(2): 122-128.
- Ahmed, R.S. and Sharma, S.B., 1997. Biochemical studies on combined effects of garlic (*Allium sativum* Linn) and ginger (*Zingiber officinale* Rosc) in albino rats. *Indian Journal of Experimental Biology*, **35**(8): 841-843.

- Aji, S.B., Ignatius., K, Asha' Adatu, Y., Nuhu, J.B., Abdulkarim, A., Aliyu, U. and Numan, P.T. 2011. Effects of Feeding Onion (*Allium cepa*) and Garlic (*Allium sativum*) on Some Performance Characteristics of Broiler Chickens. *Research Journal of Poultry Sciences*, **4**(2): 22-27.
- Alagawany, M., Ashour, E. A. and Reda, F. M. 2016. Effect of dietary supplementation of Garlic (*Allium sativum*) and Turmeric (*Curcuma longa*) on growth performance, carcass traits, blood profile and oxidative status in growing rabbits. *Annals of Animal Science*, **16**: 489-505.
- Demir, E., Sarica, S., Ozcan, M.A, and Suicmez, M. 2003. The use of natural feed additives as alternatives for an antibiotic growth Promoter in broiler diets. *British Journal of Poultry Science*, **44**: 44-45.
- Dieumou, F.E., Teguaia, A., Kuate, J.R., Tamokou, J.D., Fonge, N.B. and Dongmo, M.C. 2009. Effects of ginger (*Zingiber officinale*) and garlic (*Allium sativum*) essential oils on growth performance and gut microbial population of broiler chickens. *Livestock Research for Rural Development*, **21**(8): 23-32.
- Farinu, G.O., Ademola, S.G., and Ajayi, A.O. 2009. Growth, haematological and biochemical studies on garlic-and ginger-fed broiler chickens. *Moor Journal of Agricultural Research*, **5**: 122-128.
- Hassan, E.H. and Abdel-Raheem, S.M. 2013. Response of growing buffalo calves to dietary supplementation of caraway and garlic as natural additives. *World Applied Sciences Journal*, **22**: 408-414.
- Horton, G.M.J., Blethen, D.B., and Prasad, B.M. 1991. The effect of garlic (*Allium sativum*) on feed palatability of horses and feed consumption, selected performance and blood parameters in sheep and swine. *Canadian Journal of Animal Science*, **71**(2): 607-610.
- Hossain, M.M., Howlader, A.J., Islam, M.N., Beg, M.A.H. 2014. Evaluation of locally available herbs and spices on physical, biochemical and economical parameters on broiler production. *International Journal of Plant, Animal and Environmental Science*, **4**(1): 317-23.
- Maigandi, S.A., Tukur, H.M., Deneji, A.I., 2002. Fore-stomach digesta in diet of growing sheep. Performance and economics of production. Sokoto. *Journal of Veterinary Science*, **2**: 16-21.
- Omage, J.J., Onimisi, P.A., Adegbite, E.K and Agunbiade, M.O. 2007. The Effect of Ginger (*Zingiber officinale* Roscoe) Waste Meal on Growth Performance, Carcass characteristics, serum lipid and serum cholesterol profiles of rabbit. *Pakistan Journal of Nutrition*, **6**(4): 359-362.
- Onu, P.N. and Aja, P.M. 2011. Growth performance and haematological indices of weaned rabbits fed garlic (*Allium sativum*) & ginger (*Zingiber officinale*) supplemented diets. *International Journal of Food, Agriculture and Veterinary Science*, **1**: 51-59.
- Tager, L.R., Krause, K.M. 2011. Effects of essential oils on rumen fermentation, milk production, and feeding behavior in lactating dairy cows. *Journal of Dairy Science*, **94**: 2455-2464.
- Toghyani, M., Gheisari, A., Ghalamkari, G. and Eghbalsaid, S. 2011. Evaluation of cinnamon and garlic as antibiotic growth promoter substitutions on performance, immune responses, serum biochemical and haematological parameters in broiler chicks. *Livestock Science*, **138**(1): 167-173.

