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***In vitro* assessment of garlic (*Allium sativum*) powder as feed additive on nutrient utilization efficiency in Marwari goats**

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Abstract

The present investigation was aimed to evaluate the beneficial properties and optimum level of incorporation of Garlic powder in the diet of Marwari Goats by using *in vitro* analysis technique. Five treatment groups of dewbean straw based complete feeds i.e. T₀, T₁, T₂, T₃ and T₄ considered in the study were composed with 0, 0.5, 1, 1.5, and 2% of Garlic powder level for *in vitro* studies. The results indicated a significant ($p < 0.01$) linear increase in the values of *in vitro* digestibilities and gas production with increasing levels of Garlic powder in the complete feed. It can be concluded that Garlic powder might be used as feed additive in dewbean straw based complete feed. Further, supplementation of Garlic powder at 1.5% level of complete feed was optimum level of incorporation.

Keywords: Garlic powder, IVDMD, IVOMD, gas production

Introduction

In developing countries, crop residues and agro-industrial by-products along with grazing and scavenging are the main sources for the feeding of livestock. However, these sources are of poor nutritional value, digestibility and palatability which limit their voluntary intake by animals. Feed additives have a vital role for increasing palatability and in turn feed intake. Herbs contains plant secondary metabolites, that are eco-friendly and non-hazardous to both human handlers and animals.

The beneficial effects of garlic include antimicrobial, antithrombotic, antiarthritic, hypoglycemic and anticancer activities, respectively (Ariga and Seki, 2006)^[3]. Further, allicin and diallyl disulfide, might be responsible for the cholesterol-lowering effects of garlic in animals (Adamu *et al.*, 1982)^[1]. The present investigation was conducted to find out the optimum level of incorporation of garlic powder as feed additive in dewbean straw based complete feed by *in vitro* technique.

Materials and Methods

Collection of rumen liquor: Rumen fluid was collected from donor animals before feeding with the help of stomach tube. A suction pump was used for creating negative pressure. After collection rumen liquor was strained through muslin cloth and referred as strained rumen liquor (SRL). The rumen liquor was brought to the laboratory in a pre-warmed (39°C) thermos flask. Carbon di oxide was flushed through rumen liquor for 1 minute to maintain anaerobic conditions.

Experimental Feed: Experimental complete feed was prepared by taking roughage and concentrate mixture in the ratio of 60:40. Dewbean straw was used as sole source of roughage while concentrate mixture was prepared by mixing barley, de oiled rice bran, guar korma, ground nut cake, mineral mixture and salt. The Garlic powder were incorporated in the dewbean straw based complete feed, at 0, 0.5, 1, 1.5, and 2% levels.

Experimental procedure: *In vitro* dry matter digestibility (IVDMD) and *in vitro* organic matter digestibility (IVOMD) values were estimated by the method described by Tilley and Terry (1963)^[8]. *In vitro* total gas production (IVTGP) was determined by method described by Menke *et al.* (1979)^[4].

Results and Discussion: The results of present study in text have been presented in table 1 and presented hereunder in following subheadings

***In vitro* dry matter digestibility (IVDMD)**

The results indicated a linear increase ($P<0.01$) in IVDMD at 48 h and 72 h of incubation with the increase in the level of supplementation of garlic powder up to 1.5% level (T_3). Whereas, inclusion of garlic powder beyond 1.5% level of substrate did not have any additional improvement on IVDMD. The results of present study fall in line with the findings of Osman and Soliman *et al.* (2016) [5], that addition of garlic powder at the level of 2.5% with concentrate feed mixture and rice straw, significantly increased *in vitro* dry matter digestibility. Sahli *et al.* (2018) [7] also observed an improvement in the IVDMD after addition of garlic powder in the ration of goat.

***In vitro* organic matter digestibility (IVOMD)**

The highest IVOMD was recorded in T_3 followed by T_4 , T_2 , T_1 and T_0 groups both at 48 and 72 h of incubation *i.e.* up to 1.5% level of incorporation and at 2% level, no further effect of increase in level of garlic powder was recorded. The results

of present study were similar to findings of Sahli *et al.* (2018) [7], who reported significant increase in organic matter digestibility on 64mg garlic powder supplementation. Osman *et al.* (2016) [5] also observed significantly increased *in vitro* organic matter digestibility by inclusion of 2.5% garlic powder in basal diet.

***In vitro* total gas production (IVTGP)**

The statistical analysis of data revealed that IVTGP at 24 h of incubation was significantly highest ($P<0.01$) at 1.5% level of supplementation of garlic powder in the complete feed as compared with other treatment groups. The results of total gas production in study in test corroborates well finding of Sahli *et al.* (2018) [7] and Anassori *et al.* (2011) [2] reported that increased gas production due to garlic powder supplementation and thus the digestibility of the substrate. Pkongmun *et al.* (2010) [6] showed that the use of garlic powder *in vitro* assay increase the density of the population of cellulolytic bacteria. Similarly, Menke *et al.* (1979) [4] also observed high correlation between *in vitro* gas production and microbial growth and resulting in increased digestibility of nutrients.

Table 1: IVDMD, IVOMD and IVTGP of complete feed containing different levels of Garlic powder (%DM basis)

Parameters	T ₀ (0%)	T ₁ (0.5%)	T ₂ (1%)	T ₃ (1.5%)	T ₄ (2%)	SEM	Significant
IVDMD (At 48 h incubation)	44.56 ^a	50.82 ^b	52.84 ^c	57.56 ^d	55.28 ^{cd}	0.20	**
IVDMD (At 72 h incubation)	49.48 ^a	52.27 ^b	54.35 ^b	61.12 ^c	58.98 ^c	0.18	**
IVOMD (At 48 h incubation)	48.81 ^a	53.51 ^b	55.28 ^{bc}	61.19 ^d	57.98 ^{cd}	0.29	**
IVOMD (At 72 h incubation)	52.45 ^a	57.33 ^b	59.60 ^b	65.24 ^d	62.45 ^c	0.20	**
IVTGP (At 24 h incubation)	27.53 ^a	32.17 ^c	33.73 ^d	36.33 ^e	33.43 ^b	0.06	**

**= significant at 1% ($P<0.01$)

Conclusion

On the basis of finding of study in text it can be concluded that the supplementation of garlic powder may improved IVDMD, IVOMD and IVTGP of complete feed. Therefore, garlic powder may be used as feed additive in livestock feed. Highest values of *in vitro* dry matter digestibility at 72 h of incubation and total gas production were obtained in T_3 group containing 1.5% level of Garlic powder which indicated that 1.5% level as optimum level of incorporation of garlic powder in complete feed.

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