

Original Research

Effect of the addition of green tea to the Iraqi sheep rations and their production performance

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Production, College of
Agriculture, University of
Baghdad, Iraq.**Corresponding author:****Yaseen Alobeidi A****ABSTRACT:**

This study was undertaken at the college of Agriculture, University of Baghdad, Department of Animal Production, Animal field, for the period from 29.10.2017 to 08.01.2018 to study the effect of adding green tea (*Camellia sinensis*) to the diet at 30 and 50 g in 15 sheeps (each group having 5 animals). The results obtained showed a significant effect on the level ($P<0.05$) of daily and total increase in body weight and the efficiency of food conversion. But there were no significant difference in the amount of feed consumed and the addition of tea did not affect on the rumen fermentation pH and the nitrogen, ammonia units ($\text{NH}_3\text{-N}$) concentration. The study summarized that it is possible to have the addition of green tea to the diet that improves the weight without affecting the characteristics of the rumen fermentation pH and $\text{NH}_3\text{-N}$ concentration.

Keywords:

Green tea, Fermentation, Body weight.

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INTRODUCTION

Tea is considered now one of the most consumed beverages in Asia (Zaveri, 2006) whereas tea is the most consumed beverage in the world after water (Mazzanti *et al.*, 2009) It is now one of the most consumed beverages in Asian countries ,and planting tea is a commercial farming in more than 30 countries (Graham, 1992; Shaheen *et al.*, 2006). Tea is considered one of the most healthy beverages in the world and tea drinks are obtained from dried leaves containing high amounts of protein, amino acids, fats, sugars, fiber, vitamins and minerals (Ramdani *et al.*, 2013). When we add plant secondary metabolites such as phenols and tannins in ruminants, that would increase the availability of rumen to bypass protein and non-ammonia nitrogen supply which can be absorbed in the small intestine due to their binding ability to plant proteins (Mueller-Harvey 2006; Makkar 2003).

Although ammonia is an important source of nitrogen for microorganisms in the rumen, this can lead to excessive production of ammonia. After absorption into the wall of the rumen, it can enter the bloodstream and liver, Nitrogen waste (Attwood *et al.*, 1998; Szumacher-Strabel and Cieślak, 2010). Tannins can reduce methane production in the rumen by affecting methane production by reducing its production by slowing the transfer of species between hydrogen and methane-producing bacteria and thereby reducing their growth (Makkar, 2003). Similarly, tea saponins can reduce CH₄ and NH₃ productions (Hu *et al.*, 2005; Mao *et al.*, 2010) by reducing protozoa and the methanogenic activity of relevant microbes (Hu *et al.*, 2005; Guo *et al.*, 2008). CH₄ and NH₃ are energetically wasteful end products of rumen fermentation so that the reduction in CH₄ production in the rumen is assumed to be the reflection of more efficient feed utilization (Hu *et al.*, 2005). Thus, this study aimed to find out the best percentage of green tea to improve growth rates, digestion factor and efficiency of food conversion.

MATERIALS AND METHODS

This study was conducted in the animal field of University of Baghdad, The study continued for 60 days in addition to 12 days as a preliminary period, from the period from 29/10/2017 to 8/1/2018 on 15 sheep's. The purpose of the study was to investigate the effect of green tea (*Camellia sinensis*) on some productive characteristics of growing lambs (feed intake daily gain and feed conversion ratio) digestibility, and rumen characteristics ruminal pH and NH₃-N concentration

Growth experiment

In this experiment 15 Awassi lambs were used. They had average initial weight of 27 ± 0.50 kg at the age of 5-7 months. Lambs were divided into three equal groups (each group with five lambs) and in single cage space (1.25 × 1.25 m) and numbered according to the transactions. All lambs fed individually on a unified concentrate mixture at 3 % of Live Body Weight (LBW) while the roughage portion presented *ad libitum* for animals of the three groups. The experiment lasted for 60 days, preceded by a preliminary period of 12 days offered fodder was gradually. The roughages introduced at 10:00 am as separate concentrate diets. The remaining food Both roughages and concentrate collected and weighted every day in the morning before the begin of feeding therefore calculating the amount of daily feed intake. Every two weeks before morning feeding. The animals weigh, and the weight continued

Table 1. The chemical composition of the experimental feeds (% of dry matter)

S. No	Contents (%)	T ₁	T ₂	T ₃
1	DM	98.72	96.7	97.3
2	OM	94.78	92.91	92.91
3	CP	14.37	14.31	14.41
4	CF	9.16	6.74	7.38
5	EE	3.44	3.40	3.42
6	NEF	69.09	71.79	70.39
7	ME	12.92	13.15	13.01

ME (mj/kgDM) = CP*0.012+EE*0.031+CF*0.005+NFE*0.014 (Anon, 1975)

Table 2. Effect of green tea on feed intake and its contents on lambs

S. No	Intake (Kg)	T ₁ (Control)	T ₂ (30g)	T ₃ (50g)	Significance
1	Concentration	49.10±4.32	48.73±3.97	48.68±3.73	ns
2	Roughages	18.57±1.96	20.73± 1.79	19.11±1.82	ns
3	Total	67.07±5.78	69.47±5.66	67.80±5.47	ns
4	DM	63.84±5.48	64.86±5.28	63.71±5.11	ns
5	OM	60.44±5.19	61.23±4.98	60.40±4.84	ns
6	EE	2.20±0.17	2.15±0.17	2.13±0.17	ns
7	CF	7.20±0.63	6.62±0.54	6.70±0.55	ns
8	CP	9.08±0.77	9.77±0.79	9.63±0.76	ns
9	NEF	45.52±3.90	46.29±3.77	45.23±3.62	ns

ns: non-significant

to the end of the experiment. Samples of food concentrates and roughages collected for chemical analysis are shown in Table 1.

Digestion trials

The field digestion experiment was conducted during the seventh week of the experiment using three animals from the experiment. The waste was collected only for seven days using local waste collection bags. The waste was collected daily from the animals before the feed was provided. It was weighed by an electronic balance and samples were taken in bags and refrigerated until chemical analyses. Chemical analysis of feed and faeces were done to measure Dry Matter (DM), Crude Protein (CP), Organic Matter (OM), Ash, Crude Fiber (CF) and Ether Extract (EE) (AOAC, 2005)

Rumen fermentation characteristics

In the last week of the experiment, samples of rumen fluid were collected (before and after feeding at 3 h and 6 h) in the morning. The pH of the rumen liquid and the concentration of ammonia nitrogen, were analyzed from the animals (three animals from each treatment). At each time sampling was done using a rubber

tube connected to a hand pump to extract the fluid which entered into the rumen through the esophagus. The rumen fluid was strained through cheese cloth to remove the unfermented solid particles. Using a portable digital pH meter, the pH was determined. After that, 2-3 drops of toluene were added to 10 ml of rumen to prevent fermentation. Samples were stored at -20°C until analysis (Filípek and Dvořák, 2009).

Statistical analysis

The analyzed experimental data by applied a Completely Randomized Design (CRD) and compared the moral differences between averages by Duncan test (Duncan,1955) by using statistical program SAS (SAS, 2012).

Statistical analysis was done according to the following mathematical model:

$$Y_{ij} = \mu + T_i + e_{ij}$$

where, Y_{ij}: measured viewing value; μ: the general mean of the studied character; T_i: transaction effect; e_{ij}: random error distributed by a normal distribution with an average of zero and a variance of 2e (Lawal, 2014).

Table 3. Effect of the addition of green tea on final weight, total and daily weight gain and feed conversion ratio

S. No	Treatment	Primary weight (kg)	Final weight (kg)	Total weight increase	Daily weight gain (g)	Feed conversion ratio
1	T ₁	26.15±2.24	33.64±2.83	7.48±0.87 ^B	124.80±14.53 ^B	9.18±0.65 ^A
2	T ₂	26.92±1.60	37.53±1.97	10.61±1.08 ^A	176.86±18.15 ^A	7.06±0.68 ^B
3	T ₃	26.15±1.85	36.34±2.28	10.19±0.82 ^{AB}	169.86±13.75 ^{AB}	7.06±0.62 ^B
4	Significant	ns	ns	*	*	*

* : significant (P<0.05); ns: non-significant.

Table 4. Effect of green tea on digestibility

S. No		T ₁	T ₂	T ₃	Significance
1	DM	71.83±2.81	68.24±6.31	71.84± 3.11	ns
2	OM	52.95± 2.28	72.10±10.31	61.51±5.32	ns
3	EE	83.78±1.61	81.20±3.38	83.88±1.80	ns
4	CF	60.77±6.47	64.93±1.65	69.64±6.02	ns
5	CP	77.88±7.07	83.79±5.23	83.11±4.28	ns
6	NEF	75.13±3.16	78.76±5.29	68.44±2.00	ns

ns: non-significant.

RESULTS AND DISCUSSION

Feed intake

Data in the Table 2 shows treatment with green tea to the diet did not have any significant effect on the amount of intake either concentrate or roughages. These results agree with Kondo *et al.* (2004).

Intake of nutrient

Table 2 shows that treatment with green tea did not have any significant effect on the amount of Dry Matter (DM), Organic Matter (OM), ash, Crude Protein (CP), Crude Fiber (CF) and Ether Extract (EE).

Daily gain and feed conversion ratio

The results in Table 3 shows the effect of adding green tea to the diet on the primary weight, final weight, total weight increase, daily gain and feed conversion ratio. There was no significant difference between the Treatment in the primary weight and the final weight, while the second treatment containing 30 g of tea was significant ($P<0.05$) in the total weight increase and daily gain which reached 10.61 kg and 176.86 g compared with 7.48 kg and 124.80 g for the control ratio. The weighted increase rate of the third treatment was 50 g Tea is 10.19 kg and 169.86 g. Hence, the re-

sults of the statistical analysis in Table 3 showed that the treatment with green tea (30 g and 50 g) was significantly improved ($P<0.05$) in the feed conversion ratio with a rate of 7.06 and 7.06 respectively compared with the control treatment that reached, 9.18. Some studies have reported that green tea plants were responsible for reduced feed intakes (Wu *et al.*, 1994; Lovett *et al.*, 2006), while other researchers showed no effect of feed intake in ruminants (Saida-Nasri *et al.*, 2011; Pen *et al.*, 2007). While, Hu *et al.* (2006) reported that the goats received of green tea diet every day had higher average daily gain and feed conversion rate than those without green tea diet.

In vivo digestibility

In the present study, apparent digestibility of Dry Matter (DM), Organic Matter (OM), Crude Protein (CP), Crude Fiber (CF), Ether Extract (EE) and Nitrogen Free Extractives (NFE) did not differ ($P>0.05$) among the treatments as shown in Table 4. Previous experiments have shown a variety of responses in the apparent digestibility to the administration of green tea in diet. Some studies have demonstrated that green tea not affect nutrient digestibility. Santoso *et al.* (2004) and Wang *et al.* (2009) suggested that responses to

Table 5. Effect of green tea on rumen fermentation

S. No	Test Time treatment	NH ₃ -N mg / dcl			Ph		
		0	3	6	0	3	6
1	T ₁	1.40±10.00	15.54±0.78	11.27±1.43	6.76±0.08	6.30±0.20	6.30±0
2	T ₂	12.20±2.54	16.20±1.27	11.20±1.61	6.83±0.08	6.23±0.14	6.50±0.15
3	T ₃	11.27±0.06	16.54±1.53	11.56±1.44	6.63±0.12	6.90±0.25	6.63±0.08
4	Significant	ns	ns	ns	ns	ns	ns

ns: non-significant

green tea in terms of intake and digestibility in sheep could depend upon a diet composition, source of green tea and their level of inclusion in the diet.

Rumen fermentation

Table 5 shows that treatment with green tea did not have any significant effect on rumen fermentation (pH and nitrogen, ammonia units $\text{NH}_3\text{-N}$) at all collection times. Green tea's antibacterial properties against a variety of gram-positive and gram-negative species have been demonstrated Chou and Elrod (1999). Therefore, our supposition was that the antimicrobial activity of green tea might have negative effects on protozoa and bacteria. But, the treatments had no effect on pH, or the concentration of nitrogen, ammonia units $\text{NH}_3\text{-N}$. It would appear that feeding green tea in diets had no negative impact on ruminal fermentation.

Same results were also obtained by Eruden *et al.* (2005) as the concentration of nitrogen, ammonia units ($\text{NH}_3\text{-N}$) in the rumen was not different between the diets in this study. This good fermentability of the green tea waste may promote nitrogen absorption without increasing nitrogen, ammonia units $\text{NH}_3\text{-N}$ in the rumen. That lack of increased significant when feeding sheep on green tea is evident that green tea compounds did not significantly affect the effectiveness of microorganisms.

CONCLUSION

- The treatment with green tea improve feed conversion ratio.
- The treatment with green tea did not have any positive effects on productive characteristics (feed intake, intake of nutrients, *in vivo* digestibility, and rumen fermentation (ruminal pH and nitrogen, ammonia units $\text{NH}_3\text{-N}$ $\text{NH}_3\text{-N}$ concentration).

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