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Effects of thyme and garlic on growth and biochemical traits in goats

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Abstract

This study was conducted to investigate the effect of both thyme and garlic on growth and biochemical parameters of Iraqi black goats. Twelve kids at 3 months of age and an average of 15 kg weight were purchased randomly from the local market. They were divided into four groups: control, 3% garlic, 3% thyme and 1.5% garlic with 1.5% thyme and fed 90 days a concentrate diet at 3% of body weight plus straw ad libitum.

Kids that received garlic or thyme had higher feed consumption and average daily gain. The levels of glucose, triglycerides and cholesterol were decreased in kids supplemented with garlic and thyme compared to the control. The additives had no effect on the liver enzymes AST and ALT.

Key words: *additives, enzymes, feed conversion, Iraq, plant extracts*

Introduction

In recent years, studies have been published on the use of natural food additives in animal diets. Many secondary products or plant extracts have been used, such as essential oils, in feeding animals to improve their growth and production (Thakare 2004; Westendarp 2005). It has been observed that there is an anti-bacterial or antifungal effect in the rumen when using such additives and this improves the utilization of the diet (Wallace 2004). The use of such additives has increased after the prohibition of antibiotic usage as growth promoters in the feeding of animals. These additives may contribute a direct influence on some blood parameters including blood glucose levels as recorded by Raghuvanal et al (2007) and Mohammed et al (2004) in steers or manipulate insulin levels as reported in Holstein cows (Devant et al 2003).

Both blood and biochemical parameters are affected by the addition of foods containing phenols and tannins (Mahgoub et al 2008). Garlic and thyme are considered the world's natural foods for heart patients, as well as having antibacterial and antioxidant actions (Sebesan and Caraban2008).

Therefore, this study was conducted to investigate the effect of both garlic and thyme on the performance of goat kids by measuring growth and some blood biochemical

parameters.

Materials and methods

The study was conducted at the Animal Husbandry Station of the Faculty of Veterinary Medicine, University of Basrah. Twelve local Iraqi black goat were selected at the age of 3 months, with an average weight of 1kg. They were housed in cages (1.5x2.0m) individually such that each kid had free access to feed and water . The animals were fed four rations. The control diet included a concentrate (18% maize, 40% barley, 30% bran, 10% soybean meal plus 2% salts and vitamins (Table 1). Experimental diets contained in addition 3% dry weight of garlic powder, 3% dry weight of thyme powder and 1.5% garlic powder + 1.5% thyme powder. Both straw and water were provided ad libtum. The experiment lasted 90 days.

Table 1. Composition of the control diet

		Dry matter	Crude protein	Ether extract	Fiber	Ash
	% air dry	% in DM				
Maize	18	92.4	8.70	4.50	7.31	2.33
Barley	40	92.8	10.7	1.40	6.50	3.82
Wheat Barn	30	90.9	15.8	4.50	10.6	4.98
Soya bean meal	10	91.7	45.9	7.21	2.51	6.14
Minerals nd vitamins	2					

The goats were fed for 21 days to acclimatize them to the diets. Blood samples (10 ml/animal collected from the jugular vein prior to the morning feed) were then taken three times at monthly intervals for biochemical analysis. The samples were placed in tubes free of anticoagulant and at room temperature. They were then centrifuged at 3000 rpm for 15 minutes. Clear non-hemolyzed sera were distributed into Eppendorf tubes and saved at -20℃ as described by Coles (1987). Blood serum samples were examined for albumin, cholesterol, glucose and urea as recommended by Burtis and Ashwood (1999), triglycerides as recommended by Sigma (1990), liver enzymes including ALT and AST as recommended by Reitman and Frankel (1957), and Alkaline hosphates (ALP) as recommended by Henry (1964). The concentration of the ALP enzyme was measured as per Henry (1964). The optical density was measured with a spectrophotometer. Globulin was calculated directly by the difference between the total protein and the albumin according to Otto et al (2000).

The results were analyzed using SPSS (2016) and the means were compared using a Least Significant Test ($p< 0.05$). The mathematical model was;

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

where, Y_{ij}= value of j observation of the treatment I, μ= overall mean, T_i= effect of the i^{th} treatment (i=1-4) and e_{ij}= the experimental error associated with the observation j.

Results and Discussion

Kids that received garlic or thyme had higher feed consumption and average daily gain (Table 2). However, feed conversion did not differ. There results are in agreement with

those of Khamisabadi et al (2016) who used thyme or peppermint in the fattening of Sanjabi lambs.

Table 2. Effect of the addition of garlic or thyme on kids' performance

Parameters	Control	3% Garlic	3% Thyme	1.5% Garlic + 1.5% Thyme	SEM	*p*
Feed intake, g/d	524[c]	630[b]	720[a]	743[a]	28.7	0.05
LW gain, g/d	90.7[b]	109 [a]	113 [a]	123 [a]	3.93	0.05
Feed conversion	5.77	5.78	6.36	6.02	0.08	0.98

[abc] *Means without common superscript differ at p<0.05*

The results in Table 3 revealed a significant effect from adding garlic or thyme, or both, in several biochemical parameters. Both choesterol and triglycerides were reduced in animals supplemented with garlic and/or thyme compared to those fed the control diet. This may be due to the fact that garlic and thyme have an effect against body lipids such that it causes a decrease in both cholesterol and triglycerides (El-Katchaet al 2016). In addition, garlic has the potential to inhibit cholesterol, triglycerides and total fat by reducing the effectiveness of enzymes or inhibiting the group of thiol enzymes such as HMG-CoA (Hasan et al 2015) and CoASH (Shokrollahiet al 2016) in liver. These results are consistent with those of Shamsaldin et al (2012) and Al-Hosseiny et al (2000), who revealed that feeding 60 mg of garlic per kilogram of live weight of Zraybi goats led to a reduction in total fat levels and cholesterol compared to the control group. Our results agree with those of Chaves et al (2008) which indicated that feeding 200 mg of garlic oil/kg of feed for 90 days led to a significant decrease in the level of triglycerides in sheep.

Table 3. Effect of garlic or thyme or both on lipid level sin kids' serum

	Treatments				SEM	*p*
	Control	3% Garlic	3% Thyme	1.5% Garlic + 1.5% Thyme		
First month						
Cholesterol mg/dl	85.20 [a]	76.25[b]	70.33[b]	73.40[b]	1.85	0.05
Triglycerides mg/dl	12.53[a]	11.60[b]	11.10[b]	11.30[b]	0.18	0.05
Glucose mg/dl	80.25[a]	70.00[b]	74.00[b]	71.80[b]	1.29	0.05
Second month						
Cholesterol mg/dl	83.40[a]	75.70[b]	78.80[b]	77.12[b]	0.97	0.05
Triglycerides mg/dl	11.45[a]	7.75[b]	8.90[b]	8.10[b]	0.48	0.05
Glucose mg/dl	87.00[a]	72.60[b]	73.50[b]	74.40[b]	1.96	0.05
Third month						
Cholesterol mg/dl	86.40[a]	77.60[b]	76.56[b]	76.90[b]	1.35	0.05
Triglycerides mg/dl	12.28[a]	11.30[b]	10.45[b]	11.40[b]	0.22	0.05
Glucose mg/dl	90.00[a]	82.22[b]	83.57[b]	83.10[b]	1.03	0.05

[abc] *Means without common superscript differ at p<0.05*

Table 4 revealed no difference in total protein, albumin, and globulin in sera collected from kids supplemented with either garlic or thyme or both compared to control animals. There was no change in total protein and albumin values, although it has been shown that both garlic and thyme work to promote liver tissue to increase protein synthesis (Hussein et al 2007). The improved feed intake is important as according to Kamruzzaman et al (2011), there is a positive relationship between the total protein of the serum and the

food protein (El-Katchaet al 2016).

Urea was reduced, as shown in Table 3, in kids supplemented with either garlic or thyme compared to control group. The significant reduction in urea might be attributed to ammonia production in animal rumen (Devant et al 2003). These results were consistent with the results of Wanapat et al (2013) but differed with the results of Patra and Zhongtang (2012), which did not detect the impact of urea in the blood and may be due to differences in chemical composition and harvest phase of these plants.

Table 4. Effect of garlic or thyme or both on serum total protein ,albumin, globulin and urea

	Treatments				SEM	*p*
	CTL	**3% Garlic**	**3% Thyme**	**1.5% Garlic + 1.5% Thyme**		
First month						
Protein g/dl	6.82[a]	5.66[b]	5.86[b]	5.77[b]	0.15	0.05
Albumin g/dl	3.62[b]	4.30[a]	3.46[b]	3.40[b]	0.12	0.05
Globulin g/dl	3.20[a]	1.30[c]	2.43[b]	2.30[b]	0.22	0.05
Urea mg/dl	38.7[a]	29.7	27.6	28.[5]	1.48	0.72
Second month						
Protein g/dl	6.91[a]	6.25[c]	6.88[a]	6.56[b]	0.09	0.05
Albumin g/dl	3.54[c]	3.60[b]	3.86[a]	3.61[b]	0.04	0.05
Globulin g/dl	3.41[a]	3.40[a]	3.02[b]	3.05[b]	0.06	0.05
Urea mg/dl	54.0[b]	57.1[a]	58.7[a]	58.0[a]	0.60	0.05
Third month						
Protein g/dl	6.18[c]	6.54[b]	6.68[a]	6.56[b]	0.06	0.05
Albumin g/dl	3.66[a]	3.61[b]	3.67[a]	3.59[c]	0.01	0.05
Globulin g/dl	3.30[a]	3.05[b]	3.01[b]	2.99[c]	0.04	0.05
Urea mg/dl	44.7[a]	40.2[b]	43.3[a]	42.0[a]	0.55	0.05

[abc] *Means without common superscript differ at p<0.05*

Table 5. Effect of garlic or thyme or both on liver enzymes

	Treatments				SEM	*p*
	CTL	**3% Garlic**	**3% Thyme**	**1.5% Garlic + 1.5% Thyme**		
First month						
AST IU/L	103[a]	89.3[b]	85.6[b]	88.6[b]	2.1	0.05
ALT IU/L	18.3[a]	10.9[b]	10.4[b]	10.5[b]	1.1	0.05
ALP IU/L	17.6	16.6	15.8	16.1	0.2	0.23
Second month						
AST IU/L	90.3[a]	84.6[a]	73.3[b]	76.4[b]	2.2	0.05
ALT IU/L	11.1	10.6	10.1	10.4	0.1	0.49
ALP IU/L	7 .14	14.2	14.0	14.2	0.1	0.52
Third month						
AST IU/L	88.8	80.7	79.9	80.1	1.2	0.08
ALT IU/L	14.2	13.2	12.2	12.6	0.3	0.09
ALP IU/L	103[a]	89.3[b]	85.6[b]	88.6[b]	2.1	0.05

[abc] *Means without common superscript differ at p<0.05*

Table 5 revealed no differences in AST and ALT in supplemented kids. These results are consistent with those of Kung-Chi et al (2006). The level of ALP was reduced when garlic, thyme or both were added to the control feed due to the presence of certain compounds that reduced the effectiveness of this enzyme according to Shokrollahi et al (2016).These results are consistent with those obtained by Ohaeri (2001), who found a decrease in the values of this enzyme in the serum of mice fed 500 mg/kg of garlic oil compared to control treatment. However, the results differed from that of Hussein et al (2007), which indicated a significant increase when garlic oil (100 mg of garlic oil / kg live weight per day was added to the diet.

Conclusion

- Kids that received garlic or thyme had higher feed consumption and average daily gain.
- Adding garlic or thyme or both improved animal health as reflected in the improvement of blood protein, the reduction in lipid level and the normal levels of liver enzymes.

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Go to top