Indian Journal of Animal Sciences **81** (12): 1197–1200, December 2011

Effect of garlic, thyme and yogurt compared to antibiotics on performance, immunity and some blood parameters of broiler chickens

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Received: 18 April 2011; Accepted: 15 May 2011

ABSTRACT

The authorities banned many growth promotors, as the overuse of commercial antibiotics leads to danger of losing bacterial resistance. In this study, we tried to investigate the effect of garlic, thyme and yogurt on broilers compared to antibiotics. Arbor Acres chickens (300) were divided into 5 groups with 3 repetitions. First group as control group received only basal diet, second group was treated by 0.5 g/kg flavophospholipol as antibiotic growth promoter, third group was treated by 1 g/kg garlic powder, the fourth group received 1 g/kg thyme powder and the fifth group was fed by basal diet plus 5 g/kg yogurt. All the other conditions were the same for all the groups. After 49 days of treatment performance, immunity system and some blood parameters were measured. There were significant differences in garlic, thyme and antibiotic groups with control and yogurt groups in body weight gain, feed conversion ratio from performance, antibody titre, heterophils / lymphocytes ratio, albumin from immune system, and triglyceride from blood parameters. Cholesterol level was lower in garlic and thyme groups. Yogurt showed numerically improvements in some factors. According to the results, garlic and thyme can be used as a good alternative for commercial antibiotics.

Key words: Body weight gain, Cholesterol, Garlic, Thyme, Triglyceride, Yogurt

The positive effects of herbal plants on broilers have been reported by many studies (Tekeli *et al*. 2006). Their anti biotical potential, hypocholesterolemic effects, growth promoting and availability are the most beneficial part of herbs, which have drawn the scientists' attention. Garlic (*Allium sativum*), has been approved scientifically for use as anti-artherosclerosis, anti-microbial, hypolipidemic, anti-thrombosis, anti-hypertension, anti-diabetes. Garlic has ajoene, S-allyl cysteine, di allyl (di/tri) sulphide and the most active one allicine (Rahmatnejad *et al*. 2009). Allicine possibly reduces LDL, triglyceride and cholesterol in serum (Alder and Holub 1997), hence been used for cardiovascular diseases (Tanamai *et al*. 2004). Thyme (*Thymus vulgaris*), a member of *Lamiaceae* family, with the main components of phenols, thymol (40%) and carvacrol (15%) (Mikaili *et al*. 2010). This herb is also used traditionally for diseases (Mikaili *et al*. 2010). Demir *et al*. (2008) reported beneficial value of thyme in poultry industry. Yogurt, due to its probiotical potential, can be used instead of commercial antibiotics, too. The main probioticts in yogurt are lactic acid bacteria, and it has been reported, that *L. acidophilus* can absorb cholesterol from *in vitro* system (Gilliland *et al*. 1977, 1985). In addition, it can increase the protein digestibility and availability of minerals, viz. Cu, Mn, Ca, Fe, P for its host (Sultan *et al*. 2006).

In this study, we investigated garlic, thyme and yogurt diet on broiler chickens to study their possible effect on performance, immunity system and some blood parameters like cholesterol, LDL and HDL; and we compared these materials to the commercial antibiotics.

MATERIALS AND METHODS

Animals and dietary treatment: Chickens (300) were randomly divided into 5 treatment groups and 3 repetitions, each repetition has 20 chickens. Group 1 was used as a control group and fed basal diet. Group 2 was fed basal diet plus 0.5 g/kg flavophospholipol as antibiotic growth promoter, group 3 basal diet plus 1 g/kg garlic powder, group 4 basal diet plus 1 g/kg thyme powder and group 5 was fed basal diet plus 5 g /kg yogurt.

The basal diet was same for all the groups, and it was used in 2 forms: commercial broiler starter diet from day 1 to day 21 and commercial broiler finisher diet from day 21 to 49. The environmental conditions were equal for every

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group. All the chickens had free access to food during the experiment.

Performance: Body weight was measured in 16th, 32th and 49th day of experiment. Feed consumption, feed conversion ratio and mortality rate at the same time were determined and calculated.

Immunity system: In the 35th day of experiment, three chicks were chosen from each group and inoculated from brachial vein by 0.1 ml (5%) SRBC suspension. Blood samples were collected for SRBC antibody titres by ELISA, after 7 days from injection.

Heterophils to lymphocytes ratio were determined and globulin and albumin proportion in blood were counted from blood samples which had been obtained from brachial vein of 3 randomly chosen chicks from each group in the 49th day of experiment.

Serum parameters: Blood samples were obtained from brachial vein and centrifuged to get serum, after 12 h of fasting at 49th day of experiment. Serums were analyzed for cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL) and triglyceride by ELISA set.

Statistical analysis: After obtaining the data, they were analyzed by variance method (ANOVA) considering $P < 0.05$ using SPSS 18.0 software. The significant differences were taken to Duncan multiple range test to compare the means.

RESULTS AND DISCUSSION

Performance: The performance data on body weight gain, feed consumption and feed conversion ratio at the day of 49 were collected (Table 1). In the 3 treatment groups, the body weight gain were significantly higher than control group, despite there was no significant difference between control group and yogurt fed group, body weight gain was numerically higher in the yogurt group. These data are against the results of Onibi *et al*. (2009) and Fadlalla *et al*. (2010) who found that there is no difference between control group and broilers fed with garlic in both body weight gain and feed intake, Shi *et al*. (1999), Kumar (2005) and Afsharmanesh *et al.* (2008) achieved the same results.

Toghyani *et al.* (2010) reported that the low dosage (5g/kg) of thyme have significant effect on broiler body weight and their feed conversion ratio, while the high dosage (10g/kg) did not show this effect. Najafi *et al.* (2010) reported that the group fed on thyme-included diet had significantly better body weight and feed conversion ratio. But Tekeli *et al.* (2006) and Demir *et al.* (2008) reported contradictory results.

The reason for differences could be different strains of birds, dosages of herbs, type and amount of basal diets and different environmental condition.

Immunity system: The results of SRBC, heterophils to lymphocytes ratio, globulin and albumin counts are presented in Table 2. The effect of garlic and thyme on SRBC count were significantly higher than control group, whereas the results of antibiotic and yogurt treatment were between these 2 data and they did not show any significant difference with those 3 groups. Heterophils ratio to lymphocytes was higher in garlic, thyme and antibiotic fed groups but yogurt did not have any influence on this parameter. The globulin concentrations were same in all groups and there were no significant differences among them. The albumin values were statistically higher in groups fed garlic and thyme compared to control group, and antibiotic and yogurt groups were higher just numerically compared to control group.

Afsharmanesh *et al.* (2008) reported higher antibody titre to SRBC in garlic group while the yogurt group did not show this effect; their results were similar to our findings.

Toghyani *et al*. (2010) indicated that thyme has no effect on heterophil to lymphocytes ratio, while Al-Kassie (2009) reported the significant lower ratio in thyme-included diet.

Fadlalla *et al.* (2010) reported that garlic did not have effect on globulin and albumin concentration; the garlic amount they used was lower than that used in our experiment but their highest amount (0.6%) was numerically effective on albumin value.

Garlic stimulates the NK cells (Burger *et al*. 1993) and it increases the alkaline-phosphatase enzyme activity (Platel *et al*. 2004), also it has proven antibacterial and antifungal activities. Thyme also has antibacterial and antifungal activity (Basilico and Basilico 1999, Vincent HV 2002), in addition thymol (the main component of thyme) has antioxidant activity. Due to these facts the immune system improving activities of garlic and thyme could be predicted, as we

Table 1. Effects of treatments on performance of broilers

Treatment	Parameters		
	Body weight gain	Feed consumption	Feed conversion ratio
Control	2217.4[a]	4087.9[a]	1.84 [a]
Garlic	2592.6 [b]	3743.1 [ba]	1.44 [b]
Thyme	2649.4 [b]	3921.5 [a]	1.48 [b]
Yogurt	2453.7 [ba]	3749.6 [ba]	1.53 [ba]
Antibiotic	2708.2 [c]	3987.9 [a]	1.47 [b]

Means with different subscripts in the same column differ significantly ($P<0.05$).

Table 2. Effect of treatments on immunity system of broilers

Parameters	Treatment				
	Control	Garlic	Thyme	Yogurt	Antibiotic
SRBC	5.04[a]	7.78 [b]	7.32 [b]	6.25 [ba]	6.38 [ba]
Heterophils to lymphocytes ratio	0.43 [a]	0.59 [b]	0.62 [b]	0.39 [a]	0.67 [b]
Globulin	1.48 [a]	1.54 [a]	1.52 [a]	1.62 [a]	1.65 [a]
Albumin	1.32 [a]	1.76 [b]	1.64 [b]	1.57 [ba]	1.60 [ba]

Means with different subscripts in the same row differ significantly ($P < 0.05$).

Table 3. Effect of treatments on serum parameters of broilers

Treatment	Parameters			
	Triglyceride	Cholesterol	LDL	HDL
Control	149 [a]	123 [a]	32 [a]	77 [a]
Garlic	122 [b]	97 [b]	36 [a]	81 [a]
Thyme	128 [b]	106 [b]	35 [a]	77 [a]
Yogurt	144 [a]	111 [ba]	33 [a]	79 [a]
Antibiotic	126 [b]	124 [a]	34 [a]	75 [a]

Means with different subscripts in the same column differ significantly ($P < 0.05$).

observed in our investigation.

Serum parameters: The concentration of serum triglyceride, cholesterol, LDL and HDL are shown in Table 3. Triglyceride was lowered significantly by antibiotic, garlic and thyme-included diet compare to control and yogurt group. Garlic and thyme caused a significant decrease in the blood cholesterol level of broilers, and garlic was even more effective, while yogurt-treated group had numerically less blood cholesterol level. Antibiotic-treated group had almost same cholesterol level. There was no statistical difference among groups in the blood LDL and HDL level, and it seems that none of the substances had effect on these parameters.

Ologhobo *et al*. (2008) reported that Garlic has reducing effect on triglyceride level and the best results were obtained in 2% of garlic in the basal diet. Tekeli *et al*. (2006), Toghyani *et al.* (2010) and Najafi *et al.* (2010) reported that there is no significant decrease in triglyceride level of broilers treated by thyme, but Ali *et al*. (2007) obtained similar results. Lee *et al*. (2003) found that carvacrol (one of the major substances of thyme) has lowering influence on plasma triglyceride and as per their opinion it is because of carvacrol effect on lipogenesis.

Our results about cholesterol were contrary to some studies (Lee *et al*. 2004) (Toghyani *et al.* 2010) (Najafi and Torki 2010); they found no diminishing effect of garlic and thyme. But the results of Al-Kassie (2008), Ologhobo *et al.* (2009) and Afsharmanesh *et al*. (2008) agree with ours. Al-Kassie (2008) and Ologhobo *et al.* (2009) reported a statistically high difference in blood cholesterol level compared to control group, respectively, for thyme and garlic. Afsharmanesh *et al.* (2008) reported that garlic decreases the blood cholesterol level and antibiotic increases it significantly. Yogurt decreased the cholesterol level numerically, similar to our study. This effect of garlic can be related to its reducing activity on HMG-COA enzyme; this enzyme regulates the cholesterol bio-synthesis in liver.

HDL concentration did not change in study of Najafi *et al.* (2010) and Toghyani *et al.* (2010) on thyme, and had similar results about LDL, they found that higher amount of thyme (10 g/kg) can increase the HDL concentration. Ologhobo *et al.* (2009) reported that garlic increases the HDL and decreases the LDL level.

Data on yogurt was lesser, but it appeared that yogurt could not show any significant effect on broilers, it still needs more study. Our results showed that garlic and thyme could be a good alternative for commercial antibiotics. These showed good effect on cholesterol, albumin and antibody titre. As there is microbial resistance danger because of antibiotics overuse, we need to use such natural products to improve the performance of poultry.

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