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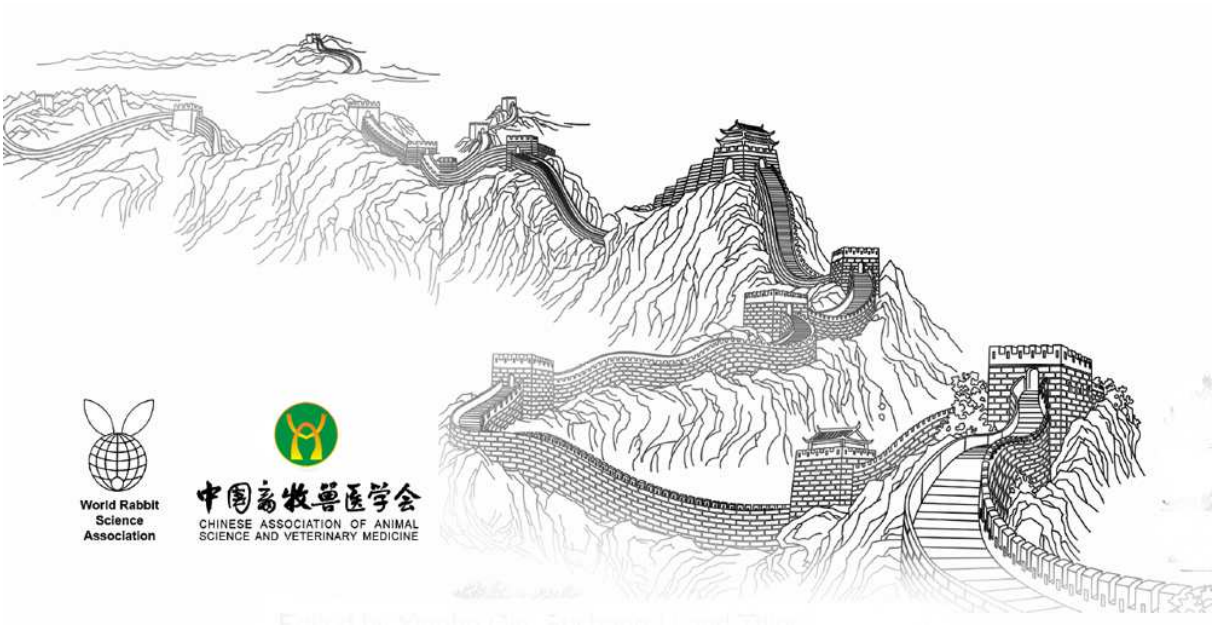

EFFECT OF DIETARY SUPPLEMENTATION WITH POTENTIAL ANTIOXIDANTS AND TANNINS ON GROWING RABBIT PERFORMANCE DURING SUMMER SEASON

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ABSTRACT

The current study compared the effect of dietary inclusion of potential antioxidants (vitamin E, selenium and hydrolysable tannins) on growth performances, carcass traits, and some blood serum metabolites of seventy growing NZW rabbits reared during summer season (31±2°C). Weaned rabbits were equally distributed among 7 dietary experimental treatments and fed *ad libitum* for 8 weeks; a basal diet without supplemented antioxidants served as a control, the other six diets contained 100 or 200 mg vitamin E/kg diet, 0.1 or 0.2 mg Se/kg diet, 1.5 or 3.0 g hydrolysable tannins/kg diet. Results indicate that total live weight gain was not significantly affected by dietary treatments. Feed intake was significantly higher in control followed by vitamin E (100 mg/kg) groups, compared to other treatments. Feed conversion ratio was improved (P<0.05) with 0.1 mg Se/kg diet (14.2%), and with 1.5 g tannins/kg diet (16.1%) compared to the control. None of the studied dietary supplements significantly affected carcass traits or blood serum metabolites of the rabbits. In summer season the dietary supplementation with vitamin E (200 mg/kg), selenium (0.1 mg/kg diet) or tannins (1.5 g/kg diet) seemed effective only to improve rabbits feed conversion ratio.

Key words: Rabbit, vitamin E, selenium, tannins, summer, growth.

INTRODUCTION

In the rabbit, stress associated with exposure to high ambient temperatures results in a decreased rabbit performance, a reduced welfare of the live animal and a worsened meat quality. Dietary antioxidants protect rabbit tissues against oxidative damage and bring back as high as possible (Abdel-Khalek, 2013).

Studies on the response to vitamin E or selenium (Se) on growth performance of rabbits have shown controversial results. El-Medany et al. (2012) reported significant response to vitamin E inclusion (120 *vs.* 40 mg/kg diet) on weight gain and feed conversion ratio (FCR) but not dressing percentage of rabbits under summer conditions, whereas, Eiben et al. (2011), Szendrő et al. (2012) and Cardinali et al. (2015) reported no additional response to vitamin E on growth performance or carcass traits of rabbits under normal environmental conditions. Concerning Se, Dokoupilová et al. (2007) comparing 0.50 *vs.* 0.125 mg Se/kg and Marounek et al. (2009) comparing 0.40 vs. 0.08 mg Se/kg diet, both reported that increasing dietary Se level resulted in inferior (however not significant) growth performance compared to the control rabbits. Although, Yanyan et al. (2011) feeding rabbits on diets containing 0.24 up to 0.70 mg Se/kg diet reported improved live weight gain and FCR but not feed intake compared to the control fed 0.08 mg Se/kg diet. Hydrolysable tannins seem to be potential antioxidants. They are a complex group of water-soluble polyphenolic that can combine with free radicals to form resonance-stabilized phenoxyl radicals. This structure confers strong antioxidant properties (Rice-Evans et al., 1996). Dalle Zotte et al. (2012) found that chestnut hydrolysable tannins at the rate of 200, 400 or 600 g/100 kg diet didn't provide improvements in health status, growth performance and carcass traits of growing rabbits. However, Liu et al. (2011) reported that under heat stress condition (33˚C), rabbits fed 5 or 10 g chestnut tannins/kg diet had an increased growth

performance. They proposed that tannins might be used in compensating the decline in the activities of antioxidant enzymes by means of reacting directly with free radicals.
This study aimed to investigate the effect of dietary supplementation with vitamin E, selenium and hydrolysable tannins on growth performance, carcass traits and blood serum metabolites of NZW rabbits under summer stress conditions.

MATERIALS AND METHODS

Treatments, feeding, management, slaughtering, and blood sampling protocol

Seventy 5 to 6 week-old NZW rabbits were equally distributed among 7 experimental dietary treatments during summer season, and fed *ad libitum on* one of the following diets for 8 weeks; a basal diet without supplementation of potential antioxidants served as a control, the other basal diets were supplemented with 100 or 200 mg vitamin E/kg, with 0.1 or 0.2 mg Se/kg, or with 1.5 or 3.0 g hydrolysable tannins/kg diet. Vitamin E as α-tocopheryl acetate, selenium as sodium selenite, was supplied by Agrivet, Egypt. Hydrolysable tannins as Silvafeed® ATX composed of 85% polyphenols, such as vescalagin, castalagin, roburin, procyanidins, proanthocyanidins, catechins, epigallocatechins, quercetin and others, was provided by Silvateam, Italy. Vitamin-mineral premixes were adjusted for the studied vitamin E or Se levels. Experimental diets were formulated to satisfy the NRC (1977) recommendations. Ingredients and calculated chemical composition of basal diet are presented in Table 1.
Rabbits were kept under the same managerial routine during summer months. Rabbitry environmental temperature and relative humidity were recorded daily. Five rabbits were assigned for chilled carcass, liver, and abdominal fat determination as proportioned to live body weight upon slaughtering, according to Blasco and Ouhayoun (1996). Also, five blood samples of each treatment were assigned for serum determination of triglycerides, total cholesterol, HDL-cholesterol, LDL-cholesterol using commercial kits (Accurex Biomedical Pvt. Ltd., India).

Table 1: Ingredients and calculated chemical composition of the basal diet.

Ingredients: Wheat bran 36.0%, soybean meal (44%) 20.3%, corn 23.0%, alfalfa straw 15.5%, Molasses 2.5%, limestone 1.85%, NaCl 0.40%, vit.&min. premix 0.30%, dl- methionine 0.05% and coccidiostatic 0.10% Total:100%
Chemical composition**:** DM, 89%; CP, 17.2%; DE (kcal/kg) 2500; CF, 12.2%; Ca, 1.03%; P, 0.52%; Lysine, 0.89%; methionine + cysteine 0.63%.

Statistical procedures

Data were subjected to a one-way ANOVA using SAS (1990). Variables having significant differences were compared using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS & DISCUSSION

Recorded rabbitry temperatures throughout the experimental period averaged 31±2°C and the relative humidity averaged 58% during day hours. Total weight gain was not significantly affected by dietary treatments (table 2). Feed intake was higher in the control followed by vitamin E (100 mg/kg) diets compared to other treatments ($P<0.05$). Feed conversion ratio was improved ($P<0.05$) with 0.1 mg Se/kg diet (14.2%), and with 1.5 g tannins/kg diet (16.1%) compared to the control. Carcass traits, slaughter yield and blood serum metabolites were not significantly affected by dietary treatments (Table 3 and 4).
Most of the research works on rabbit feeding with potential antioxidants supplementation were carried under thermo-neutral zone conditions, and many of them did not exhibit promising results (Dalle Zotte et al., 2010; Szendrő et al., 2012). Results with vitamin E supplementation are in partial agreement with those reported by El-Medany et al. (2012) that higher than 100 mg vitamin E/kg diet would improve FCR, but not dressing percentage of rabbits under summer conditions. Se supplementation showed inconstant effect, as lower level (0.1 mg/kg diet) improved FCR compared to higher level (0.2 mg/kg diet). Results on dietary supplementation with hydrolysable tannins did not

show to be beneficial for health, live performance and meat quality of growing rabbits, when reared at controlled environmental temperatures (Dalle Zotte et al., 2010). However, under high ambient temperature, Liu et al. (2011) observed that tannins were able to improve growth performance

On conclusion, the use of supra-nutritional levels of vitamin E and selenium, or the inclusion of hydrolysable tannin during hot season in rabbits farming did not modify the live performance, the carcass yield and the blood serum constituents, substantially, with exception of an improved feed conversion ratio at 200 mg vitamin E/kg, 0.1 mg Se/kg, and 1.5 g tannin/kg ($P<0.05$). These first results must be confirmed with a higher number of rabbits.

Table 2: Effect of dietary antioxidant supplements on growth performance of rabbits.

Variable Supplement (per kg diet)	Initial live weight (g)	Total live weight gain (g)	Total feed intake (g)	Feed conversion ratio
Control	688±56	1172±38	5065^{a}±58	4.36^{a}±0.15
Vitamin E (100 mg)	687±50	1120±56	4870^{ab}±148	4.39^{a}±0.18
Vitamin E (200 mg)	687±59	1077±27	4343^{c}±145	4.03^{bc}±0.09
Selenium (0.1 mg)	687±51	1146±35	4254^{c}±81	3.74^{c}±0.12
Selenium (0.2 mg)	686±45	1095±46	4526^{bc}±144	4.18^{ab}±0.19
Tannins (1.5 g)	685±46	1155±48	4195^{c}±114	3.66^{c}±0.11
Tannins (3.0 g)	685±52	1111±47	4777^{b}±88	4.35^{a}±0.17
Significance	ns	ns	*	*

ns not significant * The differences are statistically significant ($P<0.05$).

Table 3: Effect of dietary antioxidant supplements on carcass traits percentages (% live weight)

Variable Supplement (per kg diet)	chilled carcass	Liver	Abdominal fat
Control	54.9±1.3	3.3±0.18	0.66±0.05
Vitamin E (100 mg)	55.3±0.5	2.9±0.28	0.61±0.09
Vitamin E (200 mg)	54.7±0.8	2.8±0.25	0.75±0.07
Selenium (0.1 mg)	54.7±0.9	2.8±0.17	0.65±0.04
Selenium (0.2 mg)	54.2±1.4	3.2±0.12	0.74±0.01
Tannins (1.5 g)	55.5±0.6	2.9±0.19	0.73±0.01
Tannins (3.0 g)	52.5±0.7	2.6±0.25	0.66±0.07
Significance		not significant	

Table 4: Effect of dietary antioxidant supplements on some blood serum constituents (ml/dl).

Variable Supplement (per kg diet)	Total cholesterol	Triglycerides	HDL-cholesterol	LDL-cholesterol
Control	74+6	71+9	29.8+3.9	35.5+5.9
Vitamin E (100 mg)	67+7	87+8	24.6+1.4	29.8+3.9
Vitamin E (200 mg)	75+9	76+12	29.2+2.9	26.7+6.9
Selenium (0.1 mg)	93+13	79+6	32.6+3.4	52.8+9.9
Selenium (0.2 mg)	68+11	90+5	27.0+2.9	26.3+10.9
Tannins (1.5 g)	76+8	73+5	24.8+1.5	36.4+6.7
Tannins (3.0 g)	85+11	83+10	34.0+4.3	34.0+8.6
Significance	ns			

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