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The effects of dietary hesperidin supplementation on broilers performance and meat quality

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Introduction

Large quantities of citrus fruits are produced in Greece that are usually used for juice extraction creating problems in disposing the peels. Hesperidin is a bioflavonoid, which is contained in citrus cultivation by-products and possesses intense antimicrobial, antifungal and antioxidant properties. The aim of the present study was the evaluation of the dietary effects of hesperidin on broiler growth performance and meat quality.

Table 1: Body weight (BW), body weight gain (BWG), feed conversion ratio (FCR), cold carcass weight (CCW) and internal organs' weight of broilers, as they are influenced by hesperidin or a-tocopheryl acetate supplementation (LS means ± s.e.m.)

	Treatment			
	Control	HE1	HE2	VE
Initial BW (g)	36.97 ± 0.64	37.78 ± 0.64	36.63 ± 0.67	37.88 ± 0.63
Final BW (g)	1554.71 ± 29.74	1566.69 ± 29.72	1587.87 ± 30.72	1508.05 ± 29.40
BWG (g/day)	39.29 ± 0.84	39.54 ± 0.84	39.85 ± 0.84	38.04 ± 0.84
FCR	1.98 ± 0.05	1.95 ± 0.05	1.99 ± 0.05	1.96 ± 0.05
CCW (g)	1116.37 ± 25.91	1119.53 ± 26.01	1122.40 ± 26.21	1068.87 ± 25.91
Liver (g)	28.67 ± 0.87	28.97 ± 0.87	29.05 ± 0.88	27.44 ± 0.88
Heart (g)	9.09 ± 0.42	9.72 ± 0.42	9.42 ± 0.43	9.13 ± 0.42
Gizzard (g)	23.69 ± 0.58	23.09 ± 0.58	22.13 ± 0.59	24.37 ± 0.58
Abdominal fat (g)	35.72 ± 1.55	30.78 ± 1.55	33.95 ± 1.56	31.12 ± 1.55

Materials and Methods

Eighty *Ross 308* male broilers were randomly allocated into 4 equal groups. One of the groups served as a control and was given a basal diet, whereas the other three groups were given the same diet further supplemented with hesperidin at 1.5 g/kg (HE1), or hesperidin at 3.0 g/kg (HE2), or a-tocopheryl acetate at 0.2 g/kg (VE). Feed and water were offered ad libitum.

Table 2: Breast meat quality characteristics (pH, colour, intramuscular fat (IMF), cooking loss and shear value) of broilers as they are influenced by hesperidin or a-tocopheryl acetate dietary supplementation (LS means ± s.e.m.)

	Treatment			
	Control	HE1	HE2	VE
pH_{24}	6.01 ± 0.02^{ab}	5.98 ± 0.02^{a}	6.04 ± 0.02^{b}	6.04 ± 0.02^{b}
Colour L*	54.16 ± 0.64^{ab}	55.54 ± 0.64^{a}	53.47 ± 0.64^{b}	53.16 ± 0.64^{b}
Colour a*	6.70 ± 0.27^{ab}	6.12 ± 0.27^{a}	6.91 ± 0.27^{b}	7.28 ± 0.27^{b}
Colour b*	18.18 ± 0.35^{a}	17.68 ± 0.35^{a}	18.12 ± 0.35^{a}	19.35 ± 0.35^{b}
IMF (%)	1.03 ± 0.04	1.09 ± 0.04	1.08 ± 0.04	1.07 ± 0.04
Cook loss (%)	19.58 ± 0.47	19.92 ± 0.47	18.53 ± 0.47	19.99 ± 0.47
Shear Values (N/mm^2)	0.09 ± 0.01	0.09 ± 0.01	0.08 ± 0.01	0.08 ± 0.01

^{a,b} Rates in a row with different superscripts are significantly different (P<0.05)

Feed intake was recorded and all chickens were weighed for estimation of body weight gain and feed conversion ratio at 21 and 40 days of age. At 40 days of age, the chickens were slaughtered and samples of breast muscle were further examined. Colour (L*, a* and b* parameters), pH_{24}, shear force values, cooking loss, intramuscular fat and oxidative stability of lipids (on the basis of the malondialdehyde content) were measured. Data were analyzed using a General Linear Model (GLM) procedure which contained the fixed effect of the nutritional treatment.

Results and Discussion

Feed intake, growth performance, feed corversion ratio, carcass characteristics and internal organ weights were not influenced by the dietary supplementation with the hesperidin, along with shear values, cooking loss and intramuscular fat. On the other hand, some not practically important differences were found for pH_{24} and colour parameters among the treatment groups. Lipid oxidation measurements showed that as hesperidin increased in the diet, malondialdehyde values decreased in tissue samples, suggesting that hesperidin exerted an antioxidant effect on chicken breast tissues. However, dietary a-tocopheryl acetate supplementation at 0.2 g/kg of feed displayed greater antioxidant activity than hesperidin at either supplementation rate, especially after the 3rd day of storage.

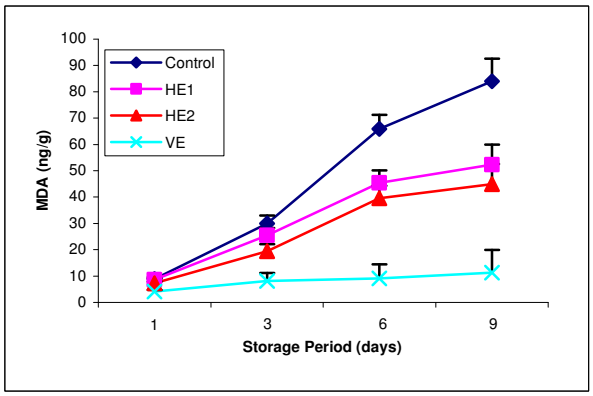

Figure 1: Effect of refrigerated storage (4ºC) (LS means ± s.e.m.) on lipid oxidation of raw broiler *pectoralis major* muscle as a function of hesperidin or a-tocopheryl acetate dietary supplementation. Higher levels of MDA (ng/g) indicate higher rates of lipid oxidation.

Conclusion

In the present experiment, the dietary administration of different levels of hesperidin positively influenced meat quality characteristics, mainly by exerting significant effect on broiler breast meat antioxidative capacity. However, further research is necessary to elucidate its exact action and establish its possible use in broiler nutrition.