J.Meat Sci., 2011, 7(1) : 13-16 Research Paper

Effect of Vitamine E and C Supplementation on Meat Characteristics of Coloured Broiler Birds in Summer Season

P.K. Pati, A.K. Mohapatra* and T. Patra

College of Veterinary Science & Animal Husbandry,
Orissa University of Agriculture & Technology, Bhubaneswar-751003

ABSTRACT

Two hundred forty day-old coloured broiler chicks were divided in to four dietary treatment groups, viz. T_1 - control group was fed with basal diet; T_2 - basal diet plus vitamin E @ 500 mg/kg of feed; T_3-basal diet plus vitamin C @ 250 mg/kg of feed; T_4- basal diet plus vitamin E & C @ 500mg/kg and @ 250 mg/kg of feed. The experiment was continued up to 8 weeks of age in summer season. The chicks were fed with starter ration up to 21 days and finisher ration from 22 to 56 days of age. The dressing percentage for T_1, T_2, T_3 and T_4 was 75.93, 75.35, 74.88 and 78.07, respectively. The water holding capacity of the meat for the control and three treatment groups were 25.97, 25.92, 26.15 and 26.29 %, respectively. The meat pH value of control and treatment groups was from 6.44 to 6.48. The thio-barbituric acid (TBA) value of T_1, T_2, T_3 and T_4 was 0.280, 0.226, 0.240 and 0.210 (mg of malonaldehyde/kg), respectively. The flavour, juiciness, texture and overall acceptability of cooked chicken nuggets kept under refrigerated storage from 0 to 14th day showed a non-significant decreasing trend.

Key words: *Coloured broiler chicks, antioxidant, dressing percentage.*

INTRODUCTION

Now-a-days, there is considerable interest in using antioxidants like vitamin C and E in foods to increase the keeping quality. In case of poultry, the supplementation of traditional anti oxidants like ascorbic acid in feed has shown promising results in attenuation of heat stress. According to Bianchi and Antunes (1999) the combined use of antioxidants can reduce the effects of stress in addition to improving meat quality. Antioxidant vitamins are essential in the animal diet for normal health. Vitamins C and E are the main natural antioxidants occuring in feeds. In the body, vitamin E is found as tocopherol in the lipid, while vitamin C is found as ascorbic acid in plasma and aqueous components of body. Vitamin E has been proved to be an effective antioxidant that protects cellular membranes against oxidative damage. But, not much study has been made on Vitamin C supplementation to poultry birds as an antioxidant. So, this study was taken up to know the effect of supplementation of either Vitamin C or Vitamin E and in combination on the characteristics of meat and meat products of coloured broiler birds during summer heat stress.

MATERIALS AND METHODS

Two hundred forty day-old coloured broiler chicks were taken and randomly distributed into four groups with three replicates having 20 chicks in each group. The chicks were reared in linear battery brooder cages. There were four dietary treatment groups, viz. T_1 or control group was fed with basal diet; T_2 - basal diet plus vitamin E @ 500 mg/kg of feed; T_3-basal diet plus vitamin C @ 250 mg/kg of feed; T_4- basal diet plus vitamin E & C @ 500mg/kg and @ 250 mg/kg of feed. Antibiotics and coccidiostats were added to the feed as per recommended rate. The experiment was continued up to 8 weeks of age. The chicks were fed with starter ration up to 21 days and finisher ration from 22 to 56 days of age as per BIS (1992) recommendation (Table 1). The chicks were vaccinated against New castle disease. Feed and water were provided *ad lib*. The average maximum and minimum temperature during the experimental

* *Corresponding author:e-mail: arun.1531@rediffmail.com*

period ranged from 36.2 to 40.6°C and 24.2 to 27.5°C, respectively. Standard analytical procedures were adopted for determination of proximate composition, water holding capacity (WHC), pH and Thio-Barbituric Acid (TBA) values of the meat. Nuggets were prepared from de-boned chicken meat with the help of a meat mincer and homogenizer. Sensory evaluation of the cooked chicken nuggets was done by a panel of five judges using 8-point hedonic scale. Statistical analysis of the data was done as per Snedecor and Cochran (1980).

Table 1. Composition of experimental rations

Ingredients	Starter (%)	Finisher (%)
Maize	54	60
Soyabean Meal	30	25
Dry Fish	10	8
De oiled Rice bran	3	4
Mineral mixture	2.7	2.7
Common Salt	0.3	0.3
Vit. AB_2D_3K	0.01	0.01
Vitamin B Complex	0.025	0.025
L-Lysine	0.05	0.05
DL methionine	0.05	0.05
Coccidiostat	0.05	0.05
V-fur (Furazolidone)	0.05	0.05

RESULTS AND DISCUSSION

Dressing percentage: The dressed weight, eviscerated weight (dressed weight minus giblet weight), giblet weight and abdominal fat weight with respect to live weight of the chicks are presented in the Table 2. The dressing percentage for the control (T_1) and different treatment groups (T_2, T_3 and T_4) was 75.93, 75.35, 74.88 and 78.07, respectively. The dressing percentage of the T_4 group was significantly ($P<0.05$) higher than the control and other vitamin supplemented groups. This fact was similar to the findings of Sahin and Kuck (2001) who reported that the supplementation of vitamin E 250 mg/kg and Se 0.2 mg/kg increased dressing percentage of Japanese quail. Eviscerated weight, giblet weight and abdominal fat percentage of the T_4 group were significantly ($P<0.05$) higher than the T_1, T2 and T_3 but there was no significant difference between T_1, T_2 and T_3. This might be due synergistic antioxidant effect of vitamin E and C to minimize lipid oxidation (Sahoo and Anjaneyulu, 2000).

Proximate composition: The moisture, protein, fat and ash content of poultry meat of different treatments are presented in Table 3. The moisture percentage of the control and the treatment groups varied from 73.78 to 76.00 %. The moisture percentage of T_1 was significantly ($P<0.05$) lower than T_4. But there was no significant difference in moisture percentage between the treatment groups (T_2, T_3 and T_4). Higher moisture in the meat of supplemented groups was due to the fact that vitamins and antioxidants caused less drip loss (Manahan *et al*., 1994). The meat protein, fat and ash percentages did not differ significantly among control and treatment groups but an increasing trend was observed with supplementation of vitamins.

pH and TBA value of the meat: The meat pH of control and treatment groups varriedfrom 6.44 to 6.48. The value marginally increased from control to the different treatment groups but they did not differ significantly. The TBA value of T_1, T_2, T_3 and T_4 was 0.280, 0.226, 0.240 and 0.210 (mg of malonaldehyde/ kg), respectively (Table 3). The TBA value of the control was significantly ($P<0.01$) higher than T_2, T_3 and T_4. The TBA value of T_2, T_3 and T_4 did not differ significantly among themselves. Environmental condition, feeding practice and type of slaughter

Table 2. Carcass quality traits of broiler birds under different treatments

Groups	Live weight (g)	Dressed weight (%)	Eviscerated weight (%)	Giblet (%)	Abdominal fat (%)
T_1	1674.66±14.93	75.93^b±0.26	71.31^b±0.10	4.97^b±0.03	3.12^b±0.05
T_2	1721.66±9.02	75.35^b±0.25	71.76^b±0.10	4.34^b±0.02	3.18^b±0.06
T_3	1694.33±3.48	74.88^b±0.72	68.37^b±0.27	3.78^b±0.02	3.02^b±0.04
T_4	1745.00±8.66	78.07^a±0.14	72.39^a±0.14	4.92^a±0.01	3.29^a±0.09

Means with same superscript within a column do not differ statistically, ($P<0.05$)

Table 3. Proximate composition, pH, TBA value and Water holding capacity of meat under different treatments

Groups	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	pH	TBA	Water holding (%)
T_1	73.78^{bc}±0.67	15.17±0.03	2.06±0.03	3.02±0.008	6.44±0.003	0.280^{a}±0.004	25.97 ±0.04
T_2	74.56^{ac}±0.40	15.31±0.29	2.09±0.04	3.02±0.078	6.47±0.026	0.226^{bc}±0.001	25.92 ±0.052
T_3	74.80^{ac}±0.52	15.32±0.06	1.98±0.005	3.02±0.051	6.45±0.15	0.240^{bc}±0.031	26.15 ±0.04
T_4	76.00^{a}±0.51	15.37±0.06	1.79±0.05	3.11±0.037	6.48±0.026	0.210^{bc}±0.001	26.29 ±0.37

Means with same superscript within a column do not differ statistically (P<0.05)

influence the oxidative stability of the meat fat. Anti oxidative effect of alpha tocopherol supplementation on chicken muscle are well established (King *et al.*, 1995; Maraschiello *et al.*, 1999; Ruiz *et al.*, 1999). This effect might be due to the stabilization of membrane bound lipid by incorporation of anti oxidants to protect tissue lipids from damage by free radical attack (Tappel, 1962).

WHC: The water holding capacity of the meat for the control and three treatment groups was 25.97, 25.92, 26.15 and 26.29 %, respectively and did not differ significantly among the treatments (Table 3). But the group showed an increased value of WHC than the rest of the treatments. According to Young *et al.*, (2003) the water holding capacity is not affected by the supplementation vitamin E and C. In other words, the water holding capacity may be related to temperature, pH and colour development. As there was no significant change in pH level the water holding capacity of the meat was not affected due to supplementations of vitamins and antioxidants.

Meat product (Nugget): Chicken nuggets were prepared from the meat of the control and combined treatment group. The product was analyzed for proximate composition like moisture, protein, fat and ash (Table 4). The moisture, protein, fat and ash percentages did not differ significantly.

Sensory attributes: The sensory attributes of cooked chicken nuggets preserved under refrigerated storage (4 ± 1^0C) from 0 to 14th day are presented in the Table 5. The appearance, flavour, juiciness, texture and overall acceptability showed a decreasing trend from 0 to 14th day of storage. There was no significant difference in different sensory parameters under different storage period (Vidyarthi, 1987). As general appearance, flavour, juiciness and texture scores recoded a slight but no significant decrease during refrigerated storage so also was the over all palatability score. The combined treatment group showed a marginal beneficial effect on sensory attributes similar to the findings reported by Dirinck *et al.* (1996), Silva *et al.* (2002) and Fellenberg and Speisky (2006).

From the above study, it was concluded that combined supplementation of vitamin E and C at the rate of 500 and 250 mg/Kg of feed resulted in improving the yield of meat. The quality of meat and meat products of coloured broiler were marginally better than the control group.

REFERENCES

Bianchi MLP and Antunes LMG (1999) Free radicals and the main dietary antioxidants Revista Nutricao, 12(2): 123-130.

Bureau of Indian Standard (BIS), 1992.

Dirinck P, Winne A De, Casteels M and Frigg (1996) Studies on vitamin E and meat quality 1. Effect of

Table 4. Proximate composition of meat nuggets of control and combined treatment

Groups	Moisture%	Protein%	Fat%	Ash%
Control	63.61±0.29	17.14±0.09	13.08±0.07	2.05±0.01
Combined treatment	64.49±0.18	17.21±0.04	12.77±0.06	2.18±0.03

Table 5. Sensory attributes of refrigerated cooked nuggets of control and combined treatment

Treatments	Refrigerated storage period (days)		
	0	7	14
		Appearance	
Control	6.87±0.09	6.79±0.12	6.71±0.09
Combined treatment	6.89±0.10	6.81±0.12	6.78±0.10
		Flavour	
Control	6.85±0.12	6.79±0.12	6.62±0.09
Combined treatment	6.88±0.09	6.81±0.12	6.71±0.11
		Juiciness	
Control	6.81±0.12	6.75±0.11	6.61±0.11
Combined treatment	6.92±0.11	6.87±0.09	6.78±0.10
		Texture	
Control	6.86±0.12	6.81±0.12	6.69±0.09
Combined treatment	6.91±0.11	6.85±0.10	6.77±0.10
		Overall acceptability	
Control	6.89±0.12	6.82±0.11	6.73±0.10
Combined treatment	6.92±0.11	6.84±0.12	6.77±0.11

feeding high vitamin E levels on time-related pork quality. J. Agri. Food. Chem. 44(1): 65-68.

Fellenberg MA and Speisky H (2006) Antioxidants: their effect on broiler oxidative stress and its meat oxidative stability. World Poult. Sci. J. 62: 53-70.

King AJ, Uijttenboogoart TG and Vries AW de (1995) Alpha tocopherol, beta carotene and ascorbic acid as anti oxidants in stored poultry muscle. J. Food. Sci. 60: 1009-1012.

Manahan FJ, Gray JI, Asghar A, Haug A, Strasburg GM, Buckley DJ and Morrissey PA (1994) Influence of diet on lipid oxidation and membrane structure in porcine muscle microsomes. J. Agri. Food. Chem. 42: 59-63.

Maraschiello C, Sarraga C and Regueiro G (1999) Gluthathione peroxidase activity, TBARS and alpha tocopherol in meat from chickens fed different diets. J. Agri. Food. Chem. 47: 867-872.

Ruiz JA, Perez-Vendrell AM and Estevegarcia E (1999) Effect of beta carotene and vitamin E an oxidative stability on leg meat of broilers fed different supplemental fats. J. Agri. Food Chem. 47: 448-454.

Sahin K and Kuck O (2001) Effects of vitamin E and selenium on performance, digestibility of nutrients and carcass characteristics of Japanese quails reared under heat stress, J. Anim. Physiol. Anim. Nutri.,85: 342-348.

Sahoo J and Anjaneyulu ASR (2000) Effect of sodium ascorbate and á-tocopherol acetate in minced chicken meat system during refrigerated storage. J. Food. Sci. Tech. 37: 388-393.

Silva RR, Oliveira TT, Nagem TJ and Leao MA (2002) Effect of flavonoids on the arachidonic acid metabolism. Medicina-Ribeirao preto, 35: 127-133.

Snedecor GW and Cochran WG (1980) Statistical Methods. 7th Edition. The Iowa state University Press, Ames, Iowa, USA.

Tappel AL (1962) Vitamins and Hormones. Academic Press, New York, 20: 493.

Vidyarthi VK (1987) Studies on organoleptic and physio-chemical properties of goat meat patties incorporating T.S.P.M. M.V.Sc thesis submitted to IVRI, Izatnagar, UP.

Young JF, Stagsted J, Jensent ISK, Karlsson AH and Henckel P (2003) Ascorbic acid, alpha tocepherol and organo supplements reduce stress-induces deterioration of chicken meat quality. Poult. Sci., 82: 1343-1351.