

ANTIOXIDANT STATUS IN BROILER BREEDER COCKS SUPPLEMENTED WITH AMLA (*Emblica officinalis*) AND GRAPE (*Vites venifera*) SEED

Priya, K.T.¹, A. Thangavel², V. Leela³ and J. Kalatharan⁴

Department of Veterinary Physiology,
Madras Veterinary College, Chennai – 600 007.

ABSTRACT

This feeding trial was conducted in twenty four PRS B₂ broiler breeder cocks from 32 to 37 weeks of age. Experimental birds were randomly divided in to four groups 1. Control: Standard broiler ration, 2. Treatment – I: Broiler ration + 1 per cent amla (*Emblica officinalis*) powder, 3. Treatment – II: Broiler ration + 1 per cent grape (*Vites venifera*) seed powder and 4. Treatment – IV: Broiler ration + 0.5 per cent amla powder + 0.5 per cent grape seed powder. Antioxidant enzymes status in the plasma was assessed during treatment period and post - treatment periods. The results of the present study revealed the birds in treatment III had significantly higher plasma SOD, catalase and GSH activities, but significantly lower ($P < 0.01$) lipid peroxidation in the plasma in comparison with other groups during treatment period.

Key words: Amla (*Emblica officinalis*), grape (*Vites venifera*) seed, antioxidant, plasma SOD, catalase, GSH, broiler breeder

INTRODUCTION

Poultry farming is one of the fastest growing segments of the agricultural sector in India, contributing 2 per cent to Gross Domestic product (GDP). The broiler sector has been the most dynamic sector of poultry production due to its marginal investments and quick returns. Rapid growth rate in broilers accelerated the metabolic rate and make them vulnerable to oxidative stress owing to increased free radical generation. Antioxidants in general are free radical scavengers that prevent cellular damage. Some of the dietary plant sources have antioxidants such as carotenoids, phenolic acids, flavonoids. Amla (*Emblica officinalis*) has

the ability to stimulate natural antioxidant enzyme systems including catalase, superoxide dismutase and glutathione peroxidase (Battacharya *et al.*, 2000; Rajak *et al.*, 2004). Grapes (*Vites venifera*) are rich in polyphenols. Proanthiocyannins in grape seed have potent antioxidant activity (Ariga and Hamano 1990; Ricardo de Silva *et al.*, 1991).

MATERIALS AND METHODS

This feeding trial was conducted in twenty four PRS B₂ broiler breeder cocks from 32 to 37 weeks of age. Experimental birds were randomly

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1. Part of M.V.Sc., thesis submitted by the first author to the Tamil Nadu Veterinary and Animal Sciences University, Chennai – 600 051.
 2. Professor and Head, 3. Associate Professor, Department of Veterinary Physiology, Madras Veterinary College, Chennai – 600 007.
 3. Professor, Department of Animal Genetics and Breeding, Madras Veterinary College, Chennai – 600 007

divided in to four groups as follows

Group	Experimental feeding	No. of birds
Control	Standard broiler ration	6
Treatment - I	Broiler ration + 1% amla powder	6
Treatment - II	Broiler ration + 1% grape seed powder	6
Treatment - III	Broiler ration + 0.5% amla + 0.5% grape seed powders	6
Total		24

The birds were reared in deep litter system under standard managemental practices throughout the experimental period. This experiment was approved by the Institutional Animal Ethical Committee. Feeding trial was conducted for a period of six weeks. Experimental rations were fed to the respective treatment groups for first three weeks (treatment period). Subsequently the experimental birds were fed with normal breeder ration without any supplementation for the next three weeks (post – treatment period).

Weekly blood samples were collected from the wing vein in sterile test tubes containing EDTA during treatment and post treatment periods and centrifuged at 50 x g for 10 min for the separation of the plasma. The level of superoxide dismutase (SOD) was estimated as per the method of Marklund and Marklund, (1974).

Catalase activity was determined by the method of Caliborne, (1985)

Reduced glutathione levels were assessed by the method of Moron *et al.* (1979)

Lipid peroxidation level was estimated according to the method of Yagi, (1976)
Statistical analysis was done by randomized block

design as suggested by Snedecor and Cochran, (1994).

RESULTS AND DISCUSSION

In the present study, birds supplemented with the combination of amla and grape seed each at 0.5 per cent level had significantly higher ($P < 0.01$) plasma SOD activity in comparison with other groups followed by treatment II and treatment I during the treatment period. In treatment III, significantly higher ($P < 0.01$) level was recorded in the first week of post-treatment period (5.99 ± 0.61 U/mg protein) followed by treatment II (5.75 ± 0.23 U/mg protein). These findings are in agreement with the observations of Jose and Kuttan, (1995); Battacharya *et al.* (2000); Khopde *et al.* (2001); Panda and Kar, (2003); Puiggros *et al.* (2003); Rajak *et al.* (2004); Anil kumar, (2005); Balu *et al.* (2005) and Reddy *et al.* (2007). Significantly higher SOD activity in treatment III could be due to synergistic activities of the natural antioxidants of amla and grape seed.

During the treatment period significantly higher ($P < 0.01$) plasma catalase activity was observed in treatment III when compared to other groups. Significantly higher ($P < 0.01$) level was recorded in the first week of post-treatment period (76.65 ± 0.95 U/mg protein). This is in accordance

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Groups	Plasma SOD activity (U/mg protein) Mean ± SE					
	Treatment period (Wks)			Post- treatment period (Wks)		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd
Control	3.52 ^{Aa} ± 0.43	3.87 ^{Aa} ± 0.20	4.34 ^{Aa} ± 0.19	4.88 ^{Ab} ± 0.22	5.22 ^{Ab} ± 0.32	5.67 ^{Ab} ± 0.09
Treatment - I	3.97 ^{Ba} ± 0.28	4.22 ^{Ba} ± 0.53	4.99 ^{Ba} ± 0.52	5.22 ^{Ab} ± 0.49	5.22 ^{Ab} ± 0.19	5.55 ^{Ab} ± 0.48
Treatment - II	4.43 ^{Ca} ± 0.23	4.82 ^{Ca} ± 0.38	5.48 ^{Cb} ± 0.23	5.75 ^{Bb} ± 0.23	5.44 ^{Ab} ± 0.40	5.76 ^{Ab} ± 0.32
Treatment - III	4.98 ^{Da} ± 0.50	5.26 ^{Da} ± 0.60	5.65 ^{Da} ± 0.46	5.99 ^{Bb} ± 0.61	5.55 ^{Ab} ± 0.11	5.62 ^{Ab} ± 0.42
Groups	Plasma Catalase activity (U/mg protein) Mean ± SE					
	Treatment period (Wks)			Post- treatment period (Wks)		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd
Control	36.78 ^{Aa} ± 0.80	41.42 ^{Ab} ± 0.86	57.92 ^{Ac} ± 0.72	68.35 ^{Ad} ± 0.61	71.02 ^{Ad} ± 0.80	76.56 ^{Ae} ± 1.10
Treatment - I	41.15 ^{Ba} ± 0.86	45.23 ^{Bb} ± 0.86	59.33 ^{Bc} ± 0.56	71.34 ^{Bde} ± 1.23	70.22 ^{Ad} ± 0.79	74.55 ^{Ae} ± 0.73
Treatment - II	43.23 ^{Ca} ± 0.76	50.23 ^{Cb} ± 0.48	61.19 ^{Cc} ± 0.65	74.15 ^{Bcd} ± 1.08	72.98 ^{Ad} ± 0.44	76.95 ^{Ad} ± 0.66
Treatment - III	46.11 ^{Da} ± 1.10	53.19 ^{Db} ± 0.47	64.16 ^{Dc} ± 0.82	76.65 ^{Cd} ± 0.95	73.88 ^{Ad} ± 0.67	75.23 ^{Ad} ± 0.32
Groups	Plasma GSH level (U/min/mg protein) Mean ± SE					
	Treatment period (Wks)			Post- treatment period (Wks)		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd
Control	1.35 ^{Aa} ± 0.02	1.43 ^{Ab} ± 0.00	1.45 ^{Ab} ± 0.00	1.47 ^{Ab} ± 0.00	1.46 ^{Ab} ± 0.00	1.48 ^{Ab} ± 0.01
Treatment - I	1.44 ^{Bb} ± 0.00	1.53 ^{Bbc} ± 0.00	1.57 ^{Bbc} ± 0.00	1.49 ^{Aab} ± 0.00	1.47 ^{Aa} ± 0.03	1.44 ^{Aa} ± 0.00
Treatment - II	1.56 ^{Cb} ± 0.00	1.63 ^{Ccd} ± 0.05	1.68 ^{Cd} ± 0.00	1.59 ^{Bbc} ± 0.01	1.49 ^{Aa} ± 0.01	1.47 ^{Aa} ± 0.00
Treatment - III	1.67 ^{Db} ± 0.02	1.74 ^{Dc} ± 0.08	1.71 ^{Dbc} ± 0.07	1.60 ^{Ba} ± 0.02	1.54 ^{Aa} ± 0.02	1.51 ^{Aa} ± 0.00
Groups	Plasma Lipid peroxidation level (nM of NDA/ml) Mean ± SE					
	Treatment period (Wks)			Post- treatment period (Wks)		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd
Control	8.27 ^{Da} ± 0.32	8.95 ^{Db} ± 0.18	9.37 ^{Db} ± 0.12	10.27 ^{Dc} ± 0.43	10.67 ^{Cc} ± 0.24	10.65 ^{Ac} ± 0.12
Treatment - I	7.15 ^{Ca} ± 0.05	7.48 ^{Ca} ± 0.15	8.15 ^{Cb} ± 0.23	9.35 ^{Cc} ± 0.22	10.18 ^{Cd} ± 0.30	10.66 ^{Ad} ± 0.28
Treatment - II	6.88 ^{Ba} ± 0.20	6.72 ^{Ba} ± 0.07	7.05 ^{Ba} ± 0.06	8.45 ^{Bb} ± 0.16	9.27 ^{Ac} ± 0.14	10.14 ^{Ad} ± 0.25
Treatment - III	5.67 ^{Aa} ± 0.11	5.80 ^{Aa} ± 0.24	6.15 ^{Aa} ± 0.32	7.87 ^{Ab} ± 0.18	9.13 ^{Ac} ± 0.17	10.14 ^{Ad} ± 0.55

All values are Mean ± SE of six birds.

Means bearing same superscripts in a row a to c and column A to D do not differ significantly @ 1% level.

with the reports of Battacharya *et al.* (2000); Khopde *et al.* (2001); Panda and Kar, (2003); Rajak *et al.* (2004); Anilkumar, (2005); Balu *et al.* (2005); Panda *et al.* (2007) and Reddy *et al.* (2007). The result of the present study suggested the synergistic antioxidant effects of amla and grape seed to combat increasing demand to decompose the increased H₂O₂ generation.

Birds supplemented with the combination of amla and grape seed each at 0.5 per cent level had significantly higher (P< 0.01) plasma GSH activity in comparison with other groups followed by treatment II and treatment I during the treatment period. In treatment III, significantly higher (P<0.01) level was recorded in the first week of post-treatment period (1.60 ± 0.02U/min/mg protein) followed by treatment II (1.59 ± 0.01U/min/mg protein). Significant increase in GSH level in the treatment III followed by treatment II and treatment I could be due to neutralization of relatively less number of H₂O₂ generated from superoxide while the remaining H₂O₂ would have been effectively decomposed by the first line of defense, GSH-Px and catalase (Wei and Lau, 1998)

In the present study, treatment III indicated significantly lower (P< 0.01) plasma lipid peroxidation level in comparison with other groups followed by treatment II and treatment I during the treatment period. Significantly lower (P<0.01) level was recorded in birds supplemented with the combination of amla and grape seed each at 0.5 per cent level (7.87 ± 0.18 nM of MDA/ml) followed by 1 per cent grape seed supplemented group (8.45±0.16 nM of MDA/ml) during the first week of post-treatment period. These findings are in agreement with the observations of Jose and Kuttan, (1995) and Battacharya *et al.* (1999); Khopde *et al.* (2001); Miura *et al.* (2003); Vigna, (2003); Balu *et al.* (2005) and Enginar *et al.*

(2007). The result of the present study suggested the conversion of lipid peroxide into alcohol derivatives rather than MDA by increased GSH level could be due to synergistic action of amla and grape seed resulting in the reduction in the lipid peroxidation in treatment III.

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