

Effect of dietary supplementation of *Embolica officinalis* on biochemical indices in Vanaraja chicks

JITENDER KUMAR¹, YASHWANT SINGH², PAWAN K VERMA³ and A R NAZKI⁴

Sher-E- Kashmir University of Agriculture and Technology, R.S. Pura, Jammu, Jammu and Kashmir 181 102 India

Received: 23 October 2008; Accepted: 18 August 2009

Key words: Amla, Biochemical, Chicks, *Embilica officinalis*

Fruit of *amla* (*Embolica officinalis* Gaetrn.) is an important dietary source of ascorbic acid, minerals, amino acids, tannins and phenolic compounds (Yokozawa *et al.* 2007). Vanaraja is a dual purpose avian strain developed by the Project Directorate on Poultry, Hyderabad, with lower metabolizing energy requirement and better adaptability, productivity and sustainability under free range (Rama Rao *et al.* 2005, 2007). Avian species are more sensitive to stress that may lead to high mortality in youngones, and reduces growth rate and increases the incidence of diseases in adult birds (Fatufe *et al.* 2004). Rearing system, environmental temperature, pollutants (metals, pesticides, hazardous gases, etc), radiation, etc increase the stress leading to excess production of free radicals and reactive oxygen species (ROS) (Valko *et al.* 2007). Supplementation of dried *amla* fruit in diet may be the cheaper source of vitamin C for farmers to obtain the desired performance of Vanaraja chicks during summer. Therefore, the present study was undertaken to elucidate the effect of dried fruit of *amla* supplementation on different biochemical parameters in Vanaraja chicks.

Vanaraja chicks, 2-week-old, were randomly divided into 2 groups of 40 chicks with 4 replicates of 10 chicks each. Group 1 chicks were fed with normal commercial diet as control group, whereas, group 2 chicks were dietary supplemented with dried *amla* fruits @ 20 g/kg of feed (2% w/w) in 8 weeks of feeding experiment.

Blood was collected directly from the heart using 18 gauge needles, in clean sterile heparinised tubes from 2 chicks of each replicate after 2 weeks of feeding dried *amla* fruits (fourth week of age). However, at eighth week blood was collected from the tarsal vein. Total protein, albumin, total cholesterol, creatinine, total bilirubin and plasma calcium concentration were estimated by standard kits using chemistry analyzer. Values of globulin were obtained by

subtracting albumin from the total protein. Statistical analyses were done by one-way ANOVA followed by Dunnet's test at different level (1% and 5%) of significance.

Vitamin C alleviates the negative side effects of stress by decreasing synthesis and secretion of corticosteroids. Although poultry can synthesize vitamin C, it becomes inadequate under stressful conditions such as low or high environmental temperature, high humidity, and high egg production rate and parasitic infestation (Eguchi *et al.* 2003). During these conditions supplementation of dried *amla* fruit in diet is the better alternative for counteracting the stress conditions. In the present study, various biochemical parameters estimated during the study are presented in Table 1. During the period of the study, the mean maximum and minimum temperature recorded was $36.0 \pm 0.79^{\circ}\text{C}$ and $23.00 \pm 0.66^{\circ}\text{C/day}$ respectively. Nonsignificant decrease in total protein was observed in *amla* treated birds, whereas significant decrease in total protein was reported in vitamin-C supplemented Japanese quails (Gursu *et al.* 2004).

However, significant increase in protein concentration was recorded in both the groups as the age progresse. Significant decrease in the albumin concentration at eighth week was observed in *amla* treated chickens as compared to control. Similar finding were also reported by Gursu *et al.* (2004) in the vitamin C supplemented Japanese quails, however, Rao *et al.* (2005) reported significant increase in the concentration of albumin in *amla* fed rats. Albumin concentration increase as the age progress (McDowell 1989), was also observed in the present study in both the groups. Concentration of globulin does not differ significantly either as age progresses or in *amla* treated chicks. Increase in A/G ratio is the indicator of increase catabolic activities than the anabolic activity. Non significant reduction in A:G ratio in *amla* treated group as compared to control group at eight weeks indicates reduction in the catabolic activity of *amla* treated birds. Various studies also suggested that the *amla* supplementation reduces the oxidative damage and ageing (Padayatty *et al.* 2003). Creatinine concentration increased nonsignificantly at fourth

Present address: ^{1&4}Division of Physiology, ²Division of Livestock Production & Management ³Division of Pharmacology & Toxicology, (e mail: drpawankv@yahoo.co.in), Faculty of Veterinary Sciences and Animal Husbandry.

Table 1. Effect of dietary supplementation of dried amla fruit on different biochemical parameters in Vanaraja chickens

Biochemical parameters	4th weeks of chickens		8th weeks of chickens	
	Control	Amla treated	Control	Amla treated
Total protein (g%)	6.99 ^a ±0.21	6.60 ^a ±0.29	7.79 ^b ±0.18	7.64 ^b ±0.19
Albumin (g%)	1.32 ^a ±0.098	1.38 ^a ±0.122	2.12 ^{bA} ±0.066	1.91 ^B ±0.079
Globulin (g%)	5.67±0.13	5.23±0.21	5.82±0.09	5.73±0.12
A/G ratio	0.23 ^a ±0.014	0.26 ^a ±0.02	0.37 ^b ±0.014	0.33 ^b ±0.008
Creatinine (mg/dl)	1.18 ^a ±0.29	1.38 ^b ±0.32	1.11 ^a ±0.02	1.06 ^a ±0.042
Total bilirubin(g/litre)	0.29±0.02 ^a	0.26±0.04	0.40±0.02 ^{A b}	0.34±0.03 ^B
Total cholesterol(mg%)	235.85 ^a ±9.18	218.19 ^a ±5.01	328.36 ^{bA} ±32.00	210.00 ^{aB} ±20.60
Plasma Ca ⁺² conc. (g/litre)	6.99 ^a ±0.22	6.60 ^a ±0.28	12.45 ^b ±1.87	14.16 ^b ±1.87

Values are expressed as mean±SE of 8 birds; Cap. Alphabets: different superscript differs significantly between groups within a time period; Small Alphabets: different superscript differs significantly between time periods with in a group.

weeks of age whereas decreased significantly ($P<0.05$) at eighth weeks of amla treatment. Similar, decrease in serum creatinine level was reported in amla supplemented rats (Rao *et al.* 2005). Serum total bilirubin, yet another stress parameter, was also reduced significantly ($P<0.05$) at eight weeks in amla treated group as compared to control. Total cholesterol decreased significantly ($P<0.05$) in amla treated chicks as compared to control birds at eighth weeks whereas the decrease was non-significant at fourth week. Non-significant reduction in the total blood cholesterol at eighth weeks in amla fed chickens as compared to fourth week suggests that supplementation of dried amla as fruit not only maintain blood total cholesterol but it also reduces its level. Similar results have also been reported in the Japanese quails (Gursu *et al.* 2004), broilers (Takahashi *et al.* 1991), mice (Parmar and Kar 2008), rabbits (Mathur *et al.* 1996) and rats (Augusti *et al.* 2001). Amla treatment does not effect the concentration of plasma Ca⁺² concentration however, Ca⁺² concentration increases significantly ($P<0.05$) on eighth week as compared to fourth week in both the groups.

Observation from present study forms the scientific basic support in suggesting that supplementation of dried amla fruit in diet have beneficial effect on different biochemical parameters and efficacy of amla for relieving the stress in Vanaraja chickens during summer season.

SUMMARY

Effect of dietary supplementation of amla on different biochemical parameters was studied in Vanaraja chicken during summer season. Significant decrease in albumin, A/G ratio, creatinine, total cholesterol and bilirubin was observed in amla treated birds as compared to control. However, nonsignificant reduction in globulin was observed in amla treated as compared to control chicks. Amla supplementation does not affect the plasma Ca⁺² concentration of Vanaraja chickens. Observation from present study suggests that dietary supplementation have the protective role on different biochemical parameters.

ACKNOWLEDGEMENTS

We gratefully acknowledge the Dean, Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-J, R. S. Pura for providing necessary facilities to conduct the work.

REFERENCES

- Augusti K T, Arathy S L, Asha R, Jaya R, Joseph Z, Lekha V, Smitha S, George S, Vijayasree V MA. 2001. Comparative study on the beneficial effects of garlic (*Allium sativum* Linn), amla (*Emblica officinalis* Gaertn) and onion (*Allium cepa* Linn) on the hyperlipidemia induced by butter fat and beef fat in rats. *Indian Journal of Experimental Biology* **39** (8): 760–66.
- Eguchi M, Miyazaki T and Masatsuji- Kato E. 2003. Cyto-protection against ischemia induced DNA cleavages and cell injuries in the rat liver by pro-vitamin C via hydrolytic conversion into ascorbates. *Molecular Cell Biochemistry* **252** (2): 17–23.
- Fatufe A A, Tinmler R and Rodchutscord M. 2004. Response to lysine intake in composition of body weight gain and efficiency of lysine utilization of growing male chickens from two genotypes. *Poultry Science* **83**: 1314–24.
- Gursu F M, Onderci M, Gulcu F and Sahin K. 2004. Effects of vitamin C and folic acid supplementation on serum paraoxonase activity and metabolites induced by heat stress *in vivo*. *Nutrition Research* **24** (2): 157–64.
- Mathur R, Sharma A, Dixit V P and Varma M. 1996. Hypolipidaemic effect of fruit juice of *Emblica officinalis* in cholesterol-fed rabbits. *Journal of Ethno-pharmacology* **50** (2): 61–68.
- McDowell L R. 1989. Vitamins in animal nutrition. Comparative aspects to human nutrition. *Vitamin A and E*. p. 10–52 93–131. (Ed.) Mc Dowell L R. Academic Press, London.
- Padayatty S, Katz A, Wang Y, Eck P, Kwon O, Lee J, Chen S, Corpe C, Dutta A, Dutta S and Levine M. 2003. Vitamin C as an antioxidant: evaluation of its role in disease prevention. *American Journal of Nutrition* **22** (1): 18–35.
- Parmar H S and Kar A. 2008. Antiperoxidative, antithyroidal, antihyperglycemic and cardio-protective role of *Citrus sinensis* peel extract in male mice. *Phytotherapy Research* **22** (6): 791–795.
- Paul D K and Shaha R K. 2004. Nutrients, vitamins and minerals

- content in common citrus fruits in the northern region of Banglade. *Pakistan Journal of Biological Sciences* **7** (2): 238–242.
- Rama Rao S V, Panda A K, Raju M V L N and Poonam N S. 2007. Effect of dietary methionine concentration on Performance of Vanaraja chicks. *Animal Nutrition and Feed Technology* **7**: 241–246.
- Rama Rao S V, Panda A K, Raju M V L N, Shuam Sunder G, Bhanja S K and Sharma R P. 2005. Performance of Vanaraja chicken diets containing different concentration of metabolizable energy at constant ratio with other essential nutrients during juvenile phase. *Indian Journal of Poultry science* **40**: 245–248.
- Rao T P, Sakaguchi N, Juneja L R, Wada E and Yokozawa T. 2005. Amla (*Emblica officinalis* Gaertn.) extracts reduce oxidative stress in streptozotocin-induced diabetic rats. *Journal of Medicinal Food* **8** (3): 362–8.
- Rimm E B, Stampfer M J, Ascherio A, Giovannucci E, Colditz G A and Willett W C. 1993. Vitamin E consumption and the risk of coronary heart disease in men. *New England Journal of Medicine* **328** (20):1450–6.
- Schwedhelm E, Maas R, Troost R and Boger R. 2003 Clinical pharmacokinetics of antioxidants and their impact on systemic oxidative stress. *Clinical Pharmacokinetics* **42**: 437–459.
- Sykes A H. 1978. Vitamin C for poultry; some recent research. *Proceedings of the Roche Symposium*. pp. 5–15.
- Takahashi K, Akiba Y and Horiguchi M. 1991. Effects of supplemental ascorbic acid on performance, organ weight and plasma cholesterol concentration in broilers treated with propylthiouracil. *British Poultry Science* **32** (3): 545–54.
- Valko M, Leibfritz D, Moncol J, Cronin M, Mazur M and Telser J. 2007. Free radicals and antioxidants in normal physiological functions and human disease. *International Journal Biochemistry Cell Biology* **39** (1): 44–84.
- Yokozawa T, Kim Y H, Kim J H, Tanaka T, Sugino H, Okubo T, Chichu D and Juneja R L. 2007. Amla (*Emblica officinalis* Gaertn) Attenuates age related renal dysfunction by oxidative stress. *Journal of Agrichemical Food Chemistry* **55**: 7744–7752.