Effect of dietary L-Carnitine supplementation on semen quality parameters in Dahlem Red chicken

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ABSTRACT

An experiment was conducted to evaluate the effect of three different levels of L-carnitine supplementation in the diet of Dahlem Red roosters on semen quality parameters for six weeks duration. Four groups were formed with 34 weeks old roosters consisting of 10 birds in each group. The birds were fed layer diet with three levels of L-carnitine (100, 200, 300 ppm) and one control diet without supplementation of L-carnitine. Semen from the birds was collected at weekly intervals and were analysed for different physical parameters. The results showed no significant effect of L-carnitine supplementation on different semen quality parameters during the experimental period.

Key words: Semen, L-Carnitine

L-Carnitine a polar natural compound plays a role in the maturation and motility of spermatozoa. L-Carnitine transports fatty acids in to mitochondria where oxidation takes place and sperm derives energy. It can serve as a scavenger of free radicals that cause lipid peroxidation. Studies have shown that dietary supplementation improves the sperm concentration in White Leghorn roosters (Neuman *et al.,* 2002; Zhai *et al.,* 2007). The present study was undertaken to study the effect of dietary supplementation on semen quality of Dahlem Red chicken.

A six week trial was conducted with 40 Dahlem Red roosters of 34 weeks of age at ICAR- Directorate on Poultry Research, Hyderabad. The experiment was conducted following the approval of the Institutional Animal Ethics Committee. The roosters were housed in individual layer cages in an open sided elevated house and had free access to water. The birds received a diet containing 2700 metabolizable energy (ME) kcal/kg and 16.0% crude protein. The roosters were grouped into four groups of ten birds each and feeding trial was conducted with L-Carnitine supplementation in the feed at 0, 100, 200, 300 ppm. Semen was collected every week by abdominal massage method in sterile glass funnel (Burrows and Quinn, 1937) and evaluated for volume and appearance soon after collection and then diluted four times in NaCl/TES (High Temperature diluent), which was used for evaluation of other semen parameters. The volume of the semen ejaculate was assessed by using a 1 ml syringe and appearance was scored by visual examination (McDaniel and Craig, 1959). Sperm motility was recorded as percentage of progressively motile spermatozoa with a drop of the diluted semen kept on a Maklers chamber and examined under 20×magnification. Using the same chamber concentration of spermatozoa of samples was estimated by CASA (Motic Instruments, Canada). Fertilizing ability of sperms was determined by its ability to reduce tetrazolium dye 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) to violet MTT formazan (Hazary *et al.,* 2001). Percentage of live and dead spermatozoa was estimated by differential staining technique using eosin–nigrosin stain (Campbell *et al.,* 1953). The slides were also used for estimating the percent abnormal spermatozoa. All data were analysed with SAS 9.2 software and $p<0.05$ was considered significant. Percentage values were arcsine transformed before analysis. Statistical analyses of data were performed by comparing between the treatments by General Linear Model repeated-measures ANOVA with weeks of semen evaluation as the repeated measure.

There was no significant effect of dietary supplementation of L-carnitine on any of the semen parameters studied (Table 1). However, the weeks of study had significant effect ($P<0.05$) on semen volume, appearance, sperm motility, fertilizing ability and abnormal sperms. Sperm concentration and percent live sperm were not affected by treatment or weeks of study. The semen volume and viable sperm percentage were not affected by feeding L-carnitine in the feed at 125 to 500 ppm level (Neuman *et al.,* 2002; Zhai *et al.,* 2007). Chatterjee *et al.* (2008) reported similar finding of no effect of oral L-carnitine supplementation for sixty days on semen volume. This result is in contrast to that of others (Neuman *et al.,* 2002; Zhai *et al.,* 2007; Chatterjee *et al.,* 2008) where increase in sperm concentration has been reported. Further Zhai *et al.* (2007) had concluded that long-term consumption of 125 ppm of L-carnitine was the only dietary treatment that sustained a persistent increase in sperm concentration. Abadi *et al.* (2008) have reported that L-carnitine supplementation has improved semen volume, sperm motility, live sperm count and sperm concentration in ostrich males. In Japanese quails L-carnitine supplementation had increased the sperm viability and decreased the multinucleated giant cells only without affecting other parameters studied (Sarica *et al.,* 2007). The route of supplementation of L-carnitine or the difference in breed might be the reason for contrasting result obtained in the present study.

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Table 1. Semen quality parameters after L-Carnitine supplementation for six weeks (Mean ± SEM)

Parameters	0 ppm	100 ppm	200 ppm	300 ppm
Volume (ml)	0.55±0.02	0.65±0.02	0.62±0.03	0.62±0.02
Appearance	3.55±0.08	3.75±0.09	3.55±0.09	3.57±0.10
Sperm Motility (%)	52.92±1.83	52.50±1.57	52.67±1.89	53.08±1.98
Sperm Concentration (millions/µl)	5.36±0.15	5.53±0.12	5.57±0.16	5.35±0.16
Fertilizing ability (MTT Formazan nM/min/million sperm)	17.04±1.02	18.08±0.87	17.10±0.75	16.52±0.87
Live sperm (%)	75.25±2.83	80.71±1.89	79.33±2.41	80.85±2.19
Abnormal sperm (%)	3.84±0.42	4.43±0.95	3.06±0.33	3.04±0.34