EFFECT OF DIETARY SUPPLEMENTATION OF AMLA AND GRAPE SEED ON SEMEN CHARACTERISTICS OF BROILER BREEDER COCKS

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ABSTRACT

This study was conducted to assess the effect of dietary supplementation of amla (Emblica officinalis) and grape (Vites venifera) seed on semen characteristics of broiler breeder cocks. Twenty four Poultry Research Station B₂ (PRS B₂) broiler breeder cocks from 32 to 38 weeks of age were randomly divided into four groups 1) Control: Standard broiler ration, 2) Treatment – I: Broiler ration + Supplementation of 1 per cent amla powder, 3) Treatment – II: Broiler ration + Supplementation of 1 per cent grape seed powder and 4) Treatment – IV: Broiler ration + Supplementation of 0.5 per cent amla powder and 0.5 per cent grape seed powder. Semen samples were collected at weekly intervals and semen characteristics were recorded during pre treatment period (0 weeks), treatment period (1-4 weeks) and post-treatment period (last 2 weeks). The results of the present study revealed that the birds supplemented with the combination of amla and grape seed each at 0.5 per cent level significantly (P = 0.01) improved the semen volume, sperm concentration, percentage of motile sperms and live sperms and significantly (P = 0.01) reduced the sperm abnormality.

Key words: Amla (Emblica officinalis), grape (Vites venifera) seed, semen characteristics -broiler breeder cocks.

INTRODUCTION

Indian poultry industry ranks fourth in egg production and fifth in broiler production in the world, contributing two per cent of Gross Domestic Product (GDP). Modern intensive poultry industry demands more rapid growth in a confined housing environment leads to great susceptibility to stress in broiler birds. Stress related changes in the semen characteristics contribute infertility problems in broiler breeders (Karaca et al., 2002). Rapid growth rate in broilers accelerated the metabolic rate and make them vulnerable to oxidative stress owing to increased free radical generation. Production of Reactive oxygen species (ROS) in the reproductive tract is detrimental not only to the fluidity of the sperm plasma membrane, but also to the integrity of DNA in the sperm nucleus. Avian sperm cell membranes have high content of long chain polyunsaturated fatty acids. Lipid peroxidation of the long chain polyunsaturated fatty acids in...
the sperm cell membrane is the primary cause of infertility (Aitken et al., 1989; Cecil and Bakst, 1993). Amla (Emblica officinalis) is as potent source of antioxidants such as carotenoids, phenolic acids and flavonoids. It has the ability to stimulate natural antioxidant enzyme systems including catalase, superoxide dismutase and glutathione peroxidase (Rajak et al., 2004 and Battacharya et al., 2000). Proanthocyanins, the biologically active constituents of grape (Vitis vinifera) seed had a potent antioxidant activity (Nakamura et al., 2003). Trans – resveratrol of grape seed exhibited a protective effect against lipid peroxidation in the sperm cell membrane and DNA damage caused by ROS (Bhat et al., 2001; Roemer and Roemer, 2002 and Aziz et al., 2003).

MATERIALS AND METHODS

The trial was conducted in twenty four PRS B₂ broiler breeder cocks for a period of seven weeks from 32 to 38 weeks of age. Experimental birds were randomly divided into four groups as follows

<table>
<thead>
<tr>
<th>Group</th>
<th>Experimental feeding</th>
<th>No. of birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Standard broiler ration</td>
<td>6</td>
</tr>
<tr>
<td>Treatment - I</td>
<td>Broiler ration + 1% amla powder</td>
<td>6</td>
</tr>
<tr>
<td>Treatment - II</td>
<td>Broiler ration + 1% grape seed powder</td>
<td>6</td>
</tr>
<tr>
<td>Treatment - III</td>
<td>Broiler ration + 0.5% amla + 0.5% grape seed powders</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>24</strong></td>
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</table>

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.

The experimental birds were fed with normal breeder ration for a week and assessed the pre treatment effect. Feeding trial was conducted for a period of six weeks. Experimental rations were fed to the respective treatment groups for four weeks (treatment period). Subsequently the experimental birds were fed with normal breeder ration without any supplementation for the next two weeks (post – treatment period).

Semen samples were collected at weekly intervals by massage technique (Burrows and Quinn, 1937) during early hours of the day. The milky drops of the ejaculate were immediately aspirated by sterile tuberculin syringes and the semen samples were then transferred to sterile test tubes kept in a water bath at 18-20°C.

Immediately after the semen collection semen volume of each bird was measured directly from the tuberculin syringe.

Sperm concentration was estimated according to the procedure of Allen and Champion, (1955).

Sperm motility and sperm abnormality were assessed as per the method of Parker et al.(1942).

Sperm livability was estimated according to the method of Tienhoven and Steel, (1957)

Statistical analysis was done by randomized block design as per Snedecor and Cochran, (1994).

RESULTS AND DISCUSSION

Effect of dietary supplementation of amla and grape seed on semen characteristics are presented in the table 1.
Highly significant \((P = 0.01)\) increase in semen volume was noticed in birds supplemented with amla and grape seed powder each at 0.5 per cent level (Treatment III) followed by treatment I and II.

The mean semen volume of the present study \(0.86 \pm 0.03 \text{ ml at 4th week of treatment}\) was comparatively higher than the reports of Ramamurthy (1983) in IC\(_2\) Strain in White Cornish breed of chicken, Kamar et al. (1984) in Fayoumi, Plymouth Rock and Rhode Island Red breeds of fowls, Stephens (1986) in White Leghorn cocks, Petrovska et al. (1987) in Rhode Island Red cocks and Bah et al. (2001) in local breeder cocks. Significant improvement in the semen volume could be attributed to higher concentration of ascorbic acid and grape seed which increase testosterone synthesis and therefore accessory glands secretion.

Treatment III revealed significantly higher \((P = 0.01)\) sperm concentration \(3091 \pm 97.54 \times 10^{6}/\mu \text{l}\) in the fourth week of treatment in comparison with treatment I and II.

Sperm concentration observed in the present study was higher in comparison with the observations of Lillie et al. (1974) in White Cornish cocks and Bah et al. (2001) in local breeder cocks, and lower than those reported by Lake and Stewart, (1978) and Ramamurthy (1983). Significant improvement in the sperm count in the birds supplemented with amla and grape seed powder (Treatment III) suggested synergistic effect of ascorbic acid and trans – resveratrol (Akmal et al., 2006; Emilia Juan et al., 2005).

Sperm motility indicated significantly higher \((P = 0.01)\) percentage \(90 \pm 0.00\)% during fourth week of treatment.

The mean sperm motility of the present study indicated higher percentages than the observations of Ramamurthy (1983) in White Cornish cocks and Bha et al. (2001) in local breeder cocks. High content of ascorbic acid in amla might have a beneficial effect on sperm motility (Monsi and Onitchi, 1990; Eskenazi et al., 2005 and Akmal et al., 2006). Significant improvement in sperm motility in treatment III could also be due to the synergistic effect of amla and grape seed on facilitated glucose transport by GLUT -5 gene expression in sperm during oxidative stress (Ajit Vaze, 2007).

Significantly higher \((P = 0.01)\) percentage of sperm livability \(90 \pm 0.02\)% was recorded during fourth week of treatment in the birds supplemented with amla and grape seed powder each at 0.5 per cent level when compared to control.


All the three treatments revealed significantly lower \((P < 0.01)\) percentage of sperm abnormality \(4 \pm 0.02\)% in comparison with the control birds.

Significant improvement in the sperm viability and decrease in sperm abnormality might be due to synergistic action of antioxidants of amla and grape seed which reduced the oxidative damage and maintained the integrity of cell membrane (Luck et al., 1995). The reduced sperm abnormality might also be due to the ability of antioxidants in the supplementations to resist the oxidative DNA damage and genetic alterations in the spermatozoa (Luck et al., 1995; Bagachi et al., 1997).
Effect of Dietary supplementation on semen characteristics of Broiler Breeder cocks

<table>
<thead>
<tr>
<th>Group</th>
<th>Sperm volume (ml) Mean ± SE</th>
<th>Sperm concentration x 10^6/µl Mean ± SE</th>
<th>Sperm motility (%) Mean ± SE</th>
<th>Live sperms (%) Mean ± SE</th>
<th>Sperm abnormality (%) Mean ± SE</th>
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<tbody>
<tr>
<td></td>
<td>0 week</td>
<td>1st week</td>
<td>2nd week</td>
<td>3rd week</td>
<td>4th week</td>
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<td>Control</td>
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<td>Treatment III</td>
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</tbody>
</table>

Same superscript (Capital letters) between treatments does not differ significantly at 1% level.

Same superscript (Small letters) between weeks does not differ significantly at 5% level.
CONCLUSION

The synergistic effect of amla and grape seed significantly improved semen characteristics by alleviating antioxidative stress in broiler breeder cocks.

REFERENCES


