Short Communication

The effect of crude oil contaminated feed on semen characteristics of cocks

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Abstract

Data from 32 Isa Brown (layer type) cocks aged 10 months were used to determine the effect of crude oil contaminated feed on their semen quality. There were four treatment groups with two replicates each. Treatment \(T_1\), which received crude oil free diet served as control. Treatments \(T_2\), \(T_3\), and \(T_4\) received crude oil contaminated feed at the rate of 1.0ml, 2.0ml and 3.0ml per kg of feed, respectively. Both feed and water were provided ad libitum. The experiment lasted for five weeks during which each cock ejaculated two times a week using the massage technique. The results indicated a highly significant \((P<0.01)\) decrease in semen volume from treatments \(T_1\) to \(T_4\) while significant \((P<0.05)\) decreases in sperm concentration and sperm motility were observed from treatments \(T_1\) to \(T_4\). Results also showed a significant \((P<0.05)\) increase in percentage dead sperm and total abnormal sperm from treatments \(T_1\) to \(T_4\). The effect of weeks was significant on body weight, semen volume, sperm concentration and percentage dead sperm. Treatment by week interaction was significant \((P<0.05)\) only on body weight. It was concluded that crude oil contaminated poultry feed had a deleterious effect on semen quality of cocks.

Key words: Crude oil, Cocks, Contamination, Semen.

Introduction

Crude oil exploration is the mainstay of Nigeria economy and constitutes about 90% of foreign exchange earning of the nation (Shore and Douben, 1994). Apart from the financial benefits, the exploration of crude oil brings about the pollution of the environment including water ways (rivers and streams). Hence, crude oil exposure presents a potential hazard to both aquatic and terrestrial species (Shore and Douben, 1994). Generally, crude oil gets to the terrestrial and aquatic ecosystems as a consequence of spillage arising from natural seepages, offshore exploration, leakage from oil wells or from oil tankers, accidents from oil tankers, land based discharges and sabotage (Awobajo, 1981). Crude oil is toxic to both plants and animal species (Ovuru et al., 2004). The toxic effects is as a result of the presence of a high level of hydrocarbons especially aromatics hydrocarbons (Da-Silva et al., 1997). Experimental evident has shown that exposure of rabbits to crude oil contaminated feed and forages retarded their attainment of puberty (Nodu et al., 2005) and increased their mortality rate (Ovuru and Orwari, 2005). Wekhe and Okere (2006) also observed hyperemia, vascular dilation and progressive necrosis in the liver as well as reduced spermatogenesis followed by degeneration of the basal cells of seminiferous tubules of the cockerel’s testes following exposure to crude oil contaminated feed. The objective of this study was to test the effect of crude oil con-
Effect of crude oil contaminated feed on semen characteristics of cocks.

Materials and Methods

Location of the study and sourcing of crude oil

The study was carried out at the Poultry Unit of the Department of Animal Science and Fisheries, Faculty of Agriculture, Delta State University, Asaba Campus. Asaba is located between 60° 45' East and 60° 12' North. Annual rainfall in Asaba ranges from 1800 mm - 3000 mm while maximum day temperature ranges from 27.5°C - 30.9°C (Federal Ministry of Aviation; Department of meteorological services Asaba, 2006). A pre-experimental period of two weeks was observed while the actual study lasted for five weeks. The two weeks pre-experimental period was used in training the cocks for semen collection using the massage technique (Burrows and Quinn, 1937). The crude oil used for the study was obtained from Shell Petroleum Development Company Port-Harcourt, with permission from the Department of Petroleum Resources, NNPC, Lagos, Nigeria. The crude oil was stored in a clean container until required for the study.

Management of the experimental animals.

Thirty-two layer type cocks of Isa Brown strain, aged 10 months with an average weight of 2.50 kg were used for the study. The cocks were sourced from a reputable farm in Asaba, Delta State. The cocks were housed on deep litter pens. They were fed ad libitum on commercial broiler finisher ration containing about 20% crude protein. Clean drinking water was also provided to the cocks ad libitum. Vitalyte, a vitamin supplement was administered to the birds through drinking water four times a week to enhance productivity. Other routine management operations including cleaning the poultry house, washing the drinkers and the feeders were also carried out. The thirty-two cocks were divided into four equal numbers and randomly assigned to four treatment groups namely T1, T2, T3, and T4. Each treatment group was replicated twice with four cocks per replicate. Treatment T1 which received crude oil free feed, served as the control. Treatments T2, T3, and T4 were fed with varying levels of crude oil contaminated feed, such that T2 cocks received crude oil contaminated feed at the rate of 1 ml per kg of feed served, T3 cocks, 2 ml per kg of feed served, while T4 cocks, received 3 ml per kg of feed served. The bodyweight of each cock was taken immediately after semen collection by means of a sensitive weighing balance. It was not taken prior to milking in order not to disturb the cock which might effect semen yield.

Semen collection and evaluation

Semen collection was done between 8am to 10am on Mondays and Thursdays consistently for five weeks. Semen was collected by the manual massage technique (Burrow and Quinn, 1937). Clean, small test tubes were used in the collection of the semen and samples were evaluated within 6 minutes after collection. The colour and consistency of the semen samples were evaluated using the criteria outlined by Omeje and Marire (1990). Semen volume was determined by drawing the semen with tuberculin syringe of 1.0 ml capacity and reading directly to the nearest 0.01 ml. Gross motility (wave pattern) was determined by examining a drop of raw, undiluted semen on a prewarmed slide under light microscope as described by Ekpenyong (1983). Progressive sperm motility was evaluated at x 40 and scored 0 - 90% with 0 representing no progressive motility. Sperm concentration was determined using haemocytometer in a method described by Ekpenyong (1983). The percentage live and dead sperm and morphologically abnormal sperm were determined using eosin-nigrosin vital staining technique (Marini and Goodman, 1969). The pH value of the semen was determined using a pH indicator paper with a measuring range of 1-13.
Data analysis
All the data generated were subjected to two factors analysis of variance in a completely randomized design according to the procedure by Steel and Torrie (1980). Statistically significant mean values of the treatment groups with regard to each semen trait were separated by means of the Duncan’s Multiple Range Test (Duncan, 1955).

Results and Discussion
Table 1 presents the mean square values for body weight and semen characteristics of cocks fed varying levels of crude oil contaminated feed. The effect of treatment was highly significant (P<0.01) on semen volume and significant (P<0.05) on sperm motility, sperm concentration, percentage dead sperm and total abnormal sperm. The effect of weeks was highly significant (P<0.01) on body weight and significant (P<0.05) on semen volume, sperm concentration and percentage dead sperm. Treatment by week interaction was significant (P<0.05) only on bodyweight. Table 2 presents the effect of different levels of crude oil contaminated feed on semen characteristics of cocks. Treatment T1, which received crude oil free feed gave the highest volume of semen and the highest number of sperm concentration per ejaculate. This was followed by treatment T2, T3, and T4 in that order. This means that crude oil exposure to the level of 1.0 – 3.0ml per kg of feed can cause a significant decrease in semen production of cocks. This decrease may be associated with the toxic effect of crude oil on the vital organs of the cocks (Nodu et al, 2005).

Table 1: Mean square values for the effect of feeding crude oil contaminated feeds on bodyweight and semen characteristics of cocks

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>DF</th>
<th>Body weight</th>
<th>Semen volume</th>
<th>Semen motility</th>
<th>Semen pH</th>
<th>Sperm Concentration</th>
<th>Dead sperm</th>
<th>Abnormal sperm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>3</td>
<td>0.02&lt;sup&gt;NS&lt;/sup&gt;</td>
<td>0.11&lt;sup&gt;**&lt;/sup&gt;</td>
<td>4890.00&lt;sup&gt;*&lt;/sup&gt;</td>
<td>21.00&lt;sup&gt;NS&lt;/sup&gt;</td>
<td>63103.03&lt;sup&gt;*&lt;/sup&gt;</td>
<td>151.53&lt;sup&gt;**&lt;/sup&gt;</td>
<td>56.58&lt;sup&gt;NS&lt;/sup&gt;</td>
</tr>
<tr>
<td>Weeks</td>
<td>4</td>
<td>0.49&lt;sup&gt;**&lt;/sup&gt;</td>
<td>0.07&lt;sup&gt;**&lt;/sup&gt;</td>
<td>1258.13&lt;sup&gt;**&lt;/sup&gt;</td>
<td>11.64&lt;sup&gt;NS&lt;/sup&gt;</td>
<td>62135.58&lt;sup&gt;**&lt;/sup&gt;</td>
<td>142.70&lt;sup&gt;**&lt;/sup&gt;</td>
<td>12.08&lt;sup&gt;NS&lt;/sup&gt;</td>
</tr>
<tr>
<td>Treatment x weeks</td>
<td>12</td>
<td>0.05&lt;sup&gt;*&lt;/sup&gt;</td>
<td>0.02&lt;sup&gt;NS&lt;/sup&gt;</td>
<td>547.29&lt;sup&gt;NS&lt;/sup&gt;</td>
<td>6.34&lt;sup&gt;NS&lt;/sup&gt;</td>
<td>10381.40&lt;sup&gt;NS&lt;/sup&gt;</td>
<td>40.12&lt;sup&gt;NS&lt;/sup&gt;</td>
<td>21.51&lt;sup&gt;NS&lt;/sup&gt;</td>
</tr>
<tr>
<td>Error</td>
<td>60</td>
<td>0.02</td>
<td>0.01</td>
<td>1194.17</td>
<td>12.31</td>
<td>24371.10</td>
<td>54.35</td>
<td>14.75</td>
</tr>
</tbody>
</table>

<sup>*P<0.05</sup>  <sup>**P<0.01</sup>  <sup>NS = Not significant</sup>

Table 2: Effect of crude oil contaminated feed on semen characteristics of layer type cocks

<table>
<thead>
<tr>
<th>Semen traits</th>
<th>T1</th>
<th>T2</th>
<th>Treatment groups</th>
<th>T3</th>
<th>T4</th>
<th>Significant level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semen volume (ml)</td>
<td>0.21±0.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.12±0.01&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.09±0.02&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.03±0.01&lt;sup&gt;d&lt;/sup&gt;</td>
<td>P&lt;0.01</td>
<td></td>
</tr>
<tr>
<td>Sperm Motility (%)</td>
<td>52.50±7.43&lt;sup&gt;a&lt;/sup&gt;</td>
<td>45.00±7.63&lt;sup&gt;b&lt;/sup&gt;</td>
<td>28.50±7.58&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>18.00±6.94&lt;sup&gt;c&lt;/sup&gt;</td>
<td>P&lt;0.05</td>
<td></td>
</tr>
<tr>
<td>Semen pH</td>
<td>7.10±1.82</td>
<td>7.23±0.77</td>
<td>7.45±0.74</td>
<td>7.20±0.68</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Sperm concentration (X 10&lt;sup&gt;8&lt;/sup&gt;)</td>
<td>107.70±6.36&lt;sup&gt;a&lt;/sup&gt;</td>
<td>94.90±4.83&lt;sup&gt;b&lt;/sup&gt;</td>
<td>92.65±8.96&lt;sup&gt;b&lt;/sup&gt;</td>
<td>69.35±10.31&lt;sup&gt;a&lt;/sup&gt;</td>
<td>P&lt;0.05</td>
<td></td>
</tr>
<tr>
<td>Dead sperm (%)</td>
<td>3.20±1.65&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.00±1.44&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.40±1.52&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.20±2.07&lt;sup&gt;a&lt;/sup&gt;</td>
<td>P&lt;0.05</td>
<td></td>
</tr>
<tr>
<td>Abnormal sperm (%)</td>
<td>1.25±0.44&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.60±0.93&lt;sup&gt;b&lt;/sup&gt;</td>
<td>4.35±1.12&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.15±0.91&lt;sup&gt;c&lt;/sup&gt;</td>
<td>P&lt;0.05</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a,b,c</sup> Means on the same row with different superscripts are significantly different (P<0.01);  (P<0.05).
Effect of crude oil contaminated feed on semen characteristics of cock

This result is in line with the report of Wekehe and Okere (2006) that crude oil exposure to a level of 5.0 - 10.0ml per litre of water reduced spermato genesis in the domestic cocks. According to the authors, the reduction in spermato genesis was as a result of the degeneration of the basal cells of the seminiferous tubules of the cocks’ testes. A significant (P<0.05) decrease in sperm motility of cocks was observed from treatment T1 to T4 as a result of feeding crude oil contaminated feed. Since sperm motility is a very good indicator of semen quality and fertilizing ability (Kammerer et al., 1972 and Etches, 1996), it follows that crude oil contaminated feed can lead to a decrease in the fertilizing capacity of cocks. The results further showed a significant (P<0.05) increase in percentage dead sperm and total abnormal sperm from treatments T1 to T4, thus implying that spermatozoa integrity were adversely affected when cocks were fed crude oil contaminated feed. The colour and consistency of ejaculates recorded across the four treatment groups were within the range of normal colour of cocks semen which is pearly white or milky and thick (Etches, 1996). Similarly, the PH value of semen observed among the treatment groups were within the range of the normal pH of cock semen which is 7.00 - 7.50 (Omeje and Marire, 1990).

Conclusion
This study has demonstrated that contamination of poultry feed with crude oil will adversely affect the semen producing ability of the cocks. Therefore urgent steps should be taken to control oil pollution in the Nigeria Delta region to protect both aquatic and terrestrial life in the area.

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References


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