Interaction of Season and Nutrition on Buffalo
Semen II-Chemical Composition

A.I. El-Azab ; A.M. Rakha ; W.S. Aboul-Fadle* and
S.S. Ibrahim

Pyramid Research Institute for Animal Reproduction
P.O. Al-Haram, Giza

Semen from twelve sexually mature buffalo bulls kept under three
systems of feeding for a full calendar year was used in the study.
The superiority of semen produced by the bulls kept on a constant
plane of nutrition was reflected on its chemical composition. An increase
in the acid phosphatase activity, chloride and inorganic phosphorus
and a decrease in calcium content was observed. It was very difficult
to correlate changes in the chemical composition of semen to chemical
changes of feed type. It was also difficult to incorporate the superiority
in the chemical composition of semen with a definite season since the
fluctuations of the chemical parameters themselves between seasons
were great. It can be concluded that chemical composition of ejacul-
ates cannot be used independently for assessing the quality of semen
in relation to feeding and season. However, the only element indica-
tive of nutritional and seasonal effect is calcium.

Fluctuations in the composite nature of semen are definitely under the in-
fluence of a number of factors including species (Rattan, Bhimasana-Rao &
Anantakrishna, 1972), individually ity (Thibier & Colchen-Baurlaud, 1972),
nutrition (Prabhu & Bhaya, 1962 and Dimitriev, 1965), environmental factors
such as temperature (Igboeli & Rakha, 1971), humidity (Sengupta, Misra &
Roy, 1963), etc. Even the composition of the ejaculate of an individual is
by no means constant but is subjected to considerable day to day fluctuations
(Mann, 1969). With the known effects of proteins, lipids, cations and possibly
anions on the metabolic activity of spermatozoa (White, 1953; Cragle & Sal-
isbury, 1959; Prabhu & Bhaya, 1962; Mann, 1964 and White, 1976), studies
comparing these parameters under different conditions received great attentions
and showed considerable controversy. However, available information
concerning the interaction of season and nutrition on the composite nature
of buffalo semen are scanty. The present study is an attempt to clarify the
situation and to furnish some basic information on semen of buffalo bulls.

Material and Methods

Semen was collected during the course of a study on the effects of nutri-
tion and season on the physical characteristics of buffalo semen (El-Azab,
Rakha & Aboul-Fadle, 1982). Semen from twelve sexually mature buffalo
bulls kept under three systems of nutritions for a full calendar year was unused
in the study (Table 1). Whole semen collected from each bull during the season was pooled and preserved in frozen state (-20°C). Estimations of the chemical constituents were made at the end of each season. Sensitive and rapid colorimetric techniques were used to determine total protein, total lipids, magnesium, chloride, inorganic phosphorus, acid and alkaline phosphatases activities using Protein-Kit (6-160-1), Lipid-Kit (6-141-1), Mag-Kit (6-141-1), Cl-Kit (6-109-1) and P-kit (6-159-1), bioMerieux Products and Laboratory Reagents; Test-Combination-Kits for alkaline phosphatase (Ec.1.3.1, Cat.No. 123 889) and acid phosphatase (Ec.1.3.2, Cat.No. 125 008), Boehringer Mannheim Gmb H Diagnostic. Determinations of sodium, potassium, and calcium contents of whole semen were made by the photometric technique using the Corning EEI Flame Photometer. Data were subjected to statistical analysis where appropriate as outlined by Victor (1976).

<table>
<thead>
<tr>
<th>Table 1: The feeding requirements per bull kept under the different systems of feeding in the different seasons.</th>
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<tbody>
<tr>
<td><strong>feeding</strong></td>
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<tr>
<td>Constant</td>
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<td>Proposed</td>
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<td>Available</td>
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</table>

**Results**

Effects of feeding and season on the chemical constituents of buffalo semen are shown in table (2). The overall means per 100 ml of the whole semen were 2.9 ± 0.1 g protein, 366.5 ± 10.8 mg lipids, 274.3 ± 2.1 mg sodium, 142.8 ± 1.8 mg potassium, 20.9 ± 0.4 mg calcium, 5.5 ± 0.1 mg magnesium, 193.9 ± 4.5 mg chloride, 22.5 ± 0.7 mg inorganic phosphorus, 375.3 ± 12.2 i.u. Acid phosphatase and 209.5 ± 11.3 i.u. Alkaline phosphatase.

It was observed that feeding conditions had significant effects on potassium, calcium, magnesium end inorganic phosphorus. The chemical constituents fluctuated significantly (P<0.01) at different seasons throughout the year. However, total lipids and calcium contents did not vary with seasons (Table 3). The interaction between nutrition and season was only significant (P<0.05) in the concentration of calcium.

TABLE (2) The interaction of nutrition and season on the chemical composition of buffalo semen.

<table>
<thead>
<tr>
<th>System of feeding/Season</th>
<th>Protein (g%)</th>
<th>Lipids (mg%)</th>
<th>Sodium (mg%)</th>
<th>Potassium (mg%)</th>
<th>Calcium (mg%)</th>
<th>Magnesium (mg%)</th>
<th>Chloride (mg%)</th>
<th>Inorganic phosphorus (mg%)</th>
<th>Phosphatase activity (i.u.)</th>
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<td>Alkaline</td>
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<td></td>
<td></td>
<td></td>
<td>Acid</td>
</tr>
</tbody>
</table>

**Constant feeding (A):**

Winter: 3.0 ± 0.3 2.9 ± 0.1 138.0 ± 7.5 19.3 ± 0.5 173.3 ± 6.3 19.1 ± 2.0 402.5 ± 52.3 241.7 ± 22.4
Spring: 3.0 ± 0.2 2.9 ± 0.1 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 26.4 ± 0.9 446.3 ± 19.9 294.3 ± 18.1
Summer: 3.0 ± 0.2 2.9 ± 0.1 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 226.0 ± 15.4
Autumn: 2.5 ± 0.2 1.9 ± 0.1 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 226.0 ± 15.4
Mean: 2.9 ± 0.1 2.9 ± 0.1 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 226.0 ± 15.4

**Proposed feeding (B):**

Winter: 2.7 ± 0.3 2.7 ± 0.3 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 226.0 ± 15.4
Spring: 3.6 ± 0.3 2.7 ± 0.3 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 226.0 ± 15.4
Summer: 3.9 ± 0.2 2.7 ± 0.3 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 226.0 ± 15.4
Autumn: 2.6 ± 0.1 1.9 ± 0.1 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 226.0 ± 15.4
Mean: 2.9 ± 0.1 2.9 ± 0.1 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 226.0 ± 15.4

**Available feeding (C):**

Winter: 2.8 ± 0.3 368.6 ± 46.9 284.0 ± 5.0 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 207.8 ± 25.7
Spring: 3.1 ± 0.2 307.6 ± 52.7 261.5 ± 2.5 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 207.8 ± 25.7
Summer: 2.7 ± 0.3 380.4 ± 37.2 266.3 ± 8.3 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 207.8 ± 25.7
Autumn: 2.7 ± 0.2 270.6 ± 35.3 271.5 ± 4.6 138.0 ± 5.5 19.5 ± 0.5 173.3 ± 6.3 24.3 ± 1.7 276.3 ± 32.8 207.8 ± 25.7
Mean: 2.8 ± 0.1 331.7 ± 22.4 270.8 ± 3.1 147.7 ± 3.6 21.0 ± 0.4 19.2 ± 9.4 22.6 ± 1.4 376.3 ± 23.5 195.9 ± 16.1
Overall mean: 2.9 ± 0.1 366.5 ± 10.8 274.3 ± 2.1 142.8 ± 1.8 20.9 ± 0.4 19.3 ± 4.5 22.5 ± 0.7 375.3 ± 12.3 209.5 ± 11.3

Values are expressed in Mean ± Standard Error (S.E.).
TABLE (3) Analysis of variance showing the interaction of feeding and season on the chemical composition of buffalo semen.

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>D.F.</th>
<th>Protein</th>
<th>Lipids</th>
<th>Sodium</th>
<th>Potassium</th>
<th>Calcium</th>
<th>Magnesium</th>
<th>Chloride</th>
<th>Inorganic phosphorus</th>
<th>Phosphatase activity</th>
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<tr>
<td>Feeding (F)</td>
<td>2</td>
<td>0.096</td>
<td>25325.805</td>
<td>283.345</td>
<td>857.625+</td>
<td>44.050+</td>
<td>0.776+</td>
<td>3848.962</td>
<td>104.137</td>
<td>1391.875</td>
</tr>
<tr>
<td>Season (S)</td>
<td>3</td>
<td>1.495</td>
<td>28855.756</td>
<td>2999.31</td>
<td>1617.32</td>
<td>44.740+</td>
<td>1.487</td>
<td>9564.725</td>
<td>267.146</td>
<td>58886.06</td>
</tr>
<tr>
<td>FxS Interaction</td>
<td>6</td>
<td>0.513</td>
<td>4990.650</td>
<td>291.737</td>
<td>88.788</td>
<td>45.932+</td>
<td>0.040</td>
<td>803.694</td>
<td>22.144</td>
<td>8021.900</td>
</tr>
<tr>
<td>Residual</td>
<td>76</td>
<td>0.346</td>
<td>9531.316</td>
<td>313.939</td>
<td>225.302</td>
<td>13.625</td>
<td>0.211</td>
<td>1526.463</td>
<td>27.748</td>
<td>12172.583</td>
</tr>
</tbody>
</table>

Values are expressed in terms of the Mean Square

+ : Significant at $P < 0.05$

++ : Highly significant at $P < 0.01$
Discussion

The superiority of semen produced by the bulls kept under a constant plane of nutrition was reflected on its chemical composition. Under this nutritional condition, an increase in the acid phosphatase activity, the concentrations of chloride and inorganic phosphorus and a decrease in the calcium content were observed. Bulls undre the grazing system of feeding were also superior to those under the available ration system except in the acid phosphatase activity, potassium, chloride and inorganic phosphorus contents. It is very difficult to correlate changes in the chemical composition of semen to chemical changes of feed type. However, Mann and Walton (1953) reported that the secretory functions of the accessory sexual glands were influenced by the change in the feeding standard. On the other hand, the present study revealed signficant fluctuations in all values of chemical components determined at different seasons without any specific indications. Oloufa, Sayed and Badreldin (1959) showed that the concentrations of total protein were 3.75, 2.95, 2.57 and 2.53 g/100 ml semen in summer, autumn, winter and spring respectively. It has been postulated by White (1976) that low concentration of potassium is necessary for optimal metabolism. High potassium concentration has a detrimental effect on the metabolic activity of spermatozoa and is counteracted by the presence of calcium (White, 1953 and Cragle & Salisbury, 1959). High concentrations of potassium and calcium were observed in the present study regardless of the level of feeding in summer and autumn. In general, the chemical composition of whole semen in the present study indicates that semen quality is lower during the autumn. Mukherjee and Bhattacharyya (1952) indicated a deterioration in the semen quality during summer and autumn. However, the individual variations in the chemical nature on the semen can not be ignored (Mann, 1969). The present results indicated that both feeding conditions and seasons have independent effects on the composite nature of semen, since there were unappreciable interactions between these parameters. However, synergaestic effect of season and feeding conditions was apparent only on the concentartion of calcium. It can be concluded that chemical composition of ejaculates can not be used independently for assessing the quality of semen in relation to feeding condition and seasonal variations. However, the only element on which nutritional and seasonal effects were found calcium was.

References


التأثير المشترك لعامل الموسم والتغذية على السائل المنوي للجاموس

2- التركيب الكيمائي

عبد السلام 이raham العزب، أحمد محمد حسن رخا، وأحمد سليم إبراهيم

مده بحوث التنازلات بالهرم - مكتب فرص الأمراض - الجيزة

أجريت هذه الدراسة باستخدام عدد اثنتا عشر طفلاً جاموس بالغين جنسيًا
وموزعين في ثلاث فئات: نلم التغذيه 발표 ولد عام على النحو التالي:
المجموعة (أ) : اخْتِبَاط النظام الثابت، المجموعة (ب) : اخْتَبَاط النظام المتحرر.
المجموعة (ج) : اخْتِبَاط النظام الاهتزاز.

والتحت الاحصائي للنتائج المدونة خلال الخمسة أسابيع الأخيرة لكل موسم تبين ما يلي:

ان نظام التغذية الثابت يعطي سائل منوي أفضل في التركيب الكيمائي
بالمقارنة مع النمط الأخرى فتحت زيادة في نشاط أنزيم الفوسفاتاز الحاضري
ومحتوى الكالسيوم والفسفور، وتقل في محتوى الكالسيوم، يكون من
الصعب أن تنتشر التجربة في التركيب الكيمائي لسائل المنوي للإنسان الكيمائي في مكونات الدم، كما يصعب أيضًا اقتران الأجور في التركيب
الكيمائي للسائل المنوي بموسم تغير التنازلات الكبرى في التركيب الكيمائي.

نفسها بين النمط المختلفة على مدار السنة ومن ذلك يمكن استنتاج أن
التركيب الكيمائي للميزات المنوي للجاموس لا يمكن استنتاج أخذًا في
حو ذا لك لقياس نوعية السائل المنوي بالنسبة للتغذية والموسم إلا أنه
يمكن أخذ عنصر الكالسيوم كدليل على الأثر المشترك للنظام والتغذية.

كلية الطب البيطري - جامعة القاهرة