A study of the level of glucose in fertile and infertile buffalo

J.K. Taher, A.M. Al-Ghareebawi and R.S. Salman

Department of Physiology, Biochemistry and Pharmacology, College of Veterinary Medicine, University of Thi-Qar, Thi-Qar, Iraq

Article information

Abstract

The study's objective is to investigate the link between the serum glucose level and the estrus phases of fertile buffalo also, the research studies serum glucose concentration in productive and fruitful buffalos in comparison to infertile buffalos at the same time and same place. Thirty samples of blood taken from fertile buffalos were selected for the first part of the study to determine the concentration of serum glucose in estrus cycle phases, this part done after determine each phase of estrus. Other 30 buffalos (15 fertile and 15 infertile) were used in the second part of the research. The part two of study aimed to compare between concentration of serum glucose in fertile and infertile buffalos. All Studied animals were chosen from the field in Thi-Qar province, south of Iraq. The results of the study showed a significant elevation of blood glucose level in the estrus phase when compared with the other steps except for diestrus, which appeared to be a non-significant (p>0.05) change. In the second part of the research, the results showed a significant elevation in the blood glucose of fertile buffalo as compared to infertile buffalo. The study appointed the use of glucose in the blood as an indicator of differentiation between sterile and fertile buffalo; the second goal of the research was to determine estrus phases by blood glucose concentration and consider it as the simple and available indicator.

Keywords:
Buffalo
Fertility
Glucose
Estrus cycles

Introduction

The buffalo take an essential position in the agricultural economy of the Mediterranean and South Asian regions because they produce meat and milk for human consumption, dragging power of farming operations, skins, and other raw materials in manufacturing uses (1). Blood metabolite profiles have been utilized vastly to detect issues and to be used as a guide for dietary reasons for diseases or decreased production (2). The serum biochemical profiles are substantial in estimating animal health conditions and diagnosing different pathophysiological and metabolic disorders in cattle (3,4). Glucose is an essential biochemical factor that regulates and modulates the metabolic functioning of the cell at diverse levels. It also acts at the hypothalamus-pituitary gonadal axis and influences animal reproductive function. Moreover, it is essential to regulate the quality of oocytes (5,6). It was noted that glucose inside the oocyte adjusts meiotic maturation, and the glucose transporter (GLUT) content increased in rat ovaries following gonadotropin use (7,8). Thus, Glucose is a central nutrient in metabolism and a must for reproductive tract function. The substantial step of dairy management and in operations of managed buffalo is the early and credible detection of pregnancy. Early cyclicity and gestation revelation in buffaloes can increase reproductive efficiency (10). Much evidence indicates that there is inhibition in growth hormone concentration in blood,
but there was an increase in insulin concentration after an extended lactation period in dairy cattle (11). Gestation also led to a significant decrease in milk production of dairy cattle in late lactation from the 5th month of pregnancy onwards (12,13). Serum glucose concentration is a suitable biochemical parameter needed for the ordinary reproductive efficacy of buffalo (14). Evaluating serum glucose concentration in lactating cattle during the early postpartum time is critical because cows need high amounts of glucose to run with the need for milk yield. After all, glucose is the main composition of the milk of cows and controls the levels of other blood metabolites (15). Positive relationships between serum glucose concentration and elevated pregnancy rate have been mentioned (16,17). Because glucose in the blood is a good signal of metabolism, provides information for control of GnRH releases, and has a central role in ovary activity (18). Determination of ovary and uterus activity by ultrasound (19).

Most researchers in Iraq study the effect of pregnancy on milk yield and composition, and other biochemical and hematomal parameters were investigated depending on dairy cattle data. This information cannot be used as a guide for dairy buffaloes because of the varying species, climate, and farmers' socioeconomic conditions. The current study was conducted to investigate the value of blood glucose levels in the estrus cycle and fertile infertile buffalo under the tropical conditions of this country.

Materials and methods

Design of study

Thirty fertile buffalos’ females used to estimation of serum glucose level in different estrus phases. Other 30 buffalo females used to second part of research, the researchers selected 15 fertile and 15 infertile buffalo females.

Animals

They studied animals selected from fields in the marshes of Thi-Qar province, south of Iraq. Most buffaloes depend on reeds and sedges in the wetlands for nutrition, while a little concentrated ration.

Detection of fertility

Detection of infertility of buffaloes based on anestrus of studied animals for one year and by ovaries examination by rectal palpation. Older people between 5 - 12 years and births from 1 to 3 estrus cycle periods which were identified by the mucous secretions from the vagina and some simple behavioral changes that appeared on the buffaloes during the estrus, in addition to the rectal palpation of the reproductive system which becomes tense during estrus (estrus at 0 days, metestrus at five days, diestrus at ten days and proestrus at 19 days).

Samples

Thirty blood samples drawn from jugular vein of fertile buffalo females and other thirty blood samples taken from fifteen infertile and fifteen fertile buffalo were selected for second part of study and all samples kept in gel tubes for 10 minute and then centrifuged 3000 rpm for 15 minutes to obtain the serum to determine blood glucose concentration after a definite diagnosis of reproductive efficacy. Serum stored at -20°C until analysis. Blood serum glucose profiles were analyzed and estimated in serum.

Statistical analysis

The Statistical Analysis System- SAS program was utilized to detect the influence of various factors on research parameters. The least significant difference (LSD) test, and T-test was used to compare among means in this research significantly (20).

Results

As appeared in table 1, the highest significant elevation in the blood glucose occurred in the estrus phase compared with other degrees57.99±2.68 mg/dl. In contrast to the estrus phase, the blood glucose levels declined significantly from their peak levels reported in the estrus phase. Specifically, glucose levels in the metestrus and proestrus phases were 51.64±2.07 and 51.08±1.97 mg/dl respectively. Remarkably, the only non-significant change in the blood glucose levels among groups was observed in the diestrus phase 54.88±2.54.

The concentration of glucose of blood in fertile and infertile buffalo was apparent as shown in table 2 in which the high significant value appeared in the productive buffalo group (n=10) which was 60.11±3.08 mg/dl in comparison with infertile buffalo group (n=20) which was 51.82±2.18mg/dl.

Table 1: Glucose concentration during estrus cycle phases in buffaloes

<table>
<thead>
<tr>
<th>Estrus phase</th>
<th>Mean ± SE (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estrus</td>
<td>57.99±2.68 a</td>
</tr>
<tr>
<td>Metestrus</td>
<td>51.64±2.07 b</td>
</tr>
<tr>
<td>Diestrus</td>
<td>54.88±2.54 ab</td>
</tr>
<tr>
<td>Proestrus</td>
<td>51.08±1.97 b</td>
</tr>
<tr>
<td>LSD value</td>
<td>4.592 *</td>
</tr>
</tbody>
</table>

The different letters in the column differed significantly at P<0.05.

Discussion

Low reproductive efficiency in the buffalo remains a major economic problem globally due to inherent reproductive problems including delayed sexual maturity, seasonality in breeding, anestrus, long calving interval, silent
heat coupled with poor expression of estrus, low conception rate and high thermal and lactation stress (21-22).

Table 2: Glucose concentration in fertile and infertile buffaloes

<table>
<thead>
<tr>
<th>Reproductive status</th>
<th>Mean ± SE (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertile buffalo</td>
<td>60.11±3.08 a</td>
</tr>
<tr>
<td>In fertile buffalo</td>
<td>51.82±2.18 b</td>
</tr>
<tr>
<td>T-test</td>
<td>6.441 *</td>
</tr>
</tbody>
</table>

The different letters in the column differed significantly at P<0.05.

In earlier studies, the blood glucose levels were considered as parameter of energy status of buffalo, so, in order to confirm the energy status in current study, we estimated the blood glucose and are depicted in table 1 and 2. We estimated high level of blood glucose in the estrus phase, as compared with other stage of estrus cycles in buffalo of the current study appeared high level of glucose in buffalo 62.2-64.7 mg /ml in different seasons while, the level of glucose in cyclic and non-cyclic buffalo similar to the present study (14,23-25).

Also, using PGF2α to synchronize estrus in ewes and recorded a high concentration of blood glucose in the follicular phase 53-60 mg/dl of estrus when compared to luteal degree 41-54 mg/dl. Also, in sheep, other study supposed that the decrement of insulin hormone sensitivity after estrus administration causes hypoglycemia (26,27).

Previous studies showed that low blood glucose levels in buffalo failed to show cyclic activity till 210 days postpartum (28). The longer calving interval and a more significant number of services to conception in cows with lower levels of glucose and albumin led to negative energy balance, which can result in decreased role of corpus luteum, low progesterone concentration during the luteal phase, and reduced fertility (29,30). Estrogen influenced blood glucose concentration. Those who studied the insulin effect on blood glucose concentration before and after low and high estrogen dose administration in sheep found that the estrogen at low doses did not influence blood glucose levels (27). However, in sheep administered estrogen at high doses, baseline serum, and minimum glucose concentrations were significantly increased. The period needed to reach severe hypoglycemia (1.5 mmol/l) was shorter when using placebo-treated sheep than in sheep treated with estrogen.

Also, the serum glucose concentration increased in pregnant buffaloes more than in non-pregnant buffaloes (31). Another study found higher serum glucose in pregnant buffaloes than non-pregnant buffaloes in Bulgaria (32). Another study showed that serum glucose could impact the subsequent reproductive performance of buffaloes after the synchronization of ovulation treatment (31). The puberty onset significantly changed serum glucose concentrations, probably including a more intensive energy metabolism (33).

Blood glucose level is an important biochemical constituent required for normal reproductive performance of buffalo.

References

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167
دراسة مستوى الجلوكوز في دورات الشبق الفسيولوجية والمرضية في الجاموس

جواد كاظم طاهر، أمير مكتوف الغربياوي و رباب شاكر سلمان

فرع الفسيولوجيا والكيمياء الحياتية والأدوية، كلية الطب البيطري، جامعة
دي قار، دي قار، العراق

الخلاصة

هتнь الدراسة الحالية لاكتشاف العلاقة بين مستوى كلوكوز الدم وأطوار دورات الشبق في إناث الجاموس الخصبة. درس البحث أيضاً تأثير كلوسوك في إناث الجاموس الخصبة والمزمنة في نفس الوقت وعمر الساء ونوع الساء. أخذت عينات من دم إناث الجاموس الخصب في الجاموس الخصب وجدت نتائج الدراسة تأثير كلوسوك كلوسوك في الدم في مرحلة الشبق المختلفة وتم بعد تحديد كل طور من أطوار الشبق بالتفريق التقليدي. كما استخدمت عينة دم أخرى من إناث جاموس (15 خصبة و 15 غير خصبة) للجزء الثاني من البحث. حدد الجزء الثاني من الدراسة قيود تشريحة يمكن أن يكون في الدم في الجاموس الخصب والمزمنة. احتضن كل الجوانب المذكورة من تحليل دم في محافظة ذي قار جنوب العراق. كشفت نتائج الدراسة زيادة معنوية في مستوى كلوسوك الدم في طور الشبق بال çevre الفسيولوجي. واعترفت الباحثين على استخدام عينة دم أخرى من إناث الجاموس الخصب والمزمنة للتفريق بين الفجر الخصب في الشبق وفي الخصم. ونستنتج من الدراسة أن تأثير كلوسوك في الدم في مرحلة الشبق المختلفة يمكن أن يكون في المنطقة الخصبة. ونستنتج من الدراسة أن تأثير كلوسوك في الدم في مرحلة الشبق المختلفة يمكن أن يكون في المنطقة الخصبة. ونستنتج من الدراسة أن تأثير كلوسوك في الدم في مرحلة الشبق المختلفة يمكن أن يكون في المنطقة الخصبة.