The Effect Iodine Supplement on the Sexual Activity And Semen Characteristics of Friesian Bulls

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Summary

The present study was carried out on a total of 10 clinical healthy Friesian bulls, aged 14-18 months with body weights 280-426 kg at the beginning of the experiment. The selected bulls were allotted into two groups, treated group supplemented by 1.25 mg potassium iodide/head/day (n = 6) and untreated one served as control (n = 4). The mean values of the relative weight gain measured weekly for the iodine treated group (4.98 ± 2.60%) was significant higher than the control one (2.70 ± 0.72%). The ejaculate volume, packed cell volume, individual sperm motility, live sperm, initial fructose concentration, and total sperm abnormalities were found to be 4.20±1.08 ml, 5.56±2.8%, 65.70±10.15%, 59.22±8.04%, 128.50±83.13 mg/100 ml semen and 16.17±7.78% for the iodine supplemented group and to be 3.13±1.20 ml, 3.90±1.17%, 44.80±14.60%, 55.00±14.30%, 68.69±59.38 mg/100 ml semen and 18.30±8.0% for the control one, respectively. There was a significant ($P<0.01$) increase in testosterone, T_3 and T_4 level for iodine supplement group in comparison to the control one. It could be concluded that, potassium iodide supplement to the bulls have a beneficial effect on growth and maturation as well as, semen quality and quantity. It improves the endocrinological output of hormones.

Introduction

Iodine is referred to as a trace mineral, since the amount necessary to maintain normal body condition is very small. The animal body contains only about one part of iodine to three million parts of body weight. Most of the iodine is concentrated in the thyroid gland *(1).* Iodine is an essential element that is necessary for normal thyroid function, iodine from dietary sources is used in the synthesis of thyroxin (T_4) and triiodothyroxine (T_3) within the thyroid gland *(2).* The presence of a functioning thyroid is a

prerequisite for normal growth and maturation. The mechanisms by which the thyroid hormones produce metamorphic changes are not fully known. Presumably, the hormone may act as a trigger for genetically determined sequence of changes in various cells. In producing these changes it appears that T_4 or T_3 acts directly and locally on the cells whose developmental processes it directs *(3)*.

The administration of potassium iodine to bulls improved the ejaculate volume *(4)*. Furthermore, *(5)* cited that feeding iodine (0.5 gm potassium iodine/head/day) during summer improved the ejaculate volume in the Friesian bulls. Likewise, *(4; 2)* noticed that in regions where iodine deficiency occurs, bulls fertility is affected due to decreased libido, ejaculate volume, sperm motility and sperm cell concentration. Moreover, supplement potassium iodide to these bulls improved the libido, ejaculate volume, sperm motility and sperm cell concentration. Furthermore, It has been found (6) that in experimental hypothyroidism, male goats exhibited loss of libido, lowering of sperm viability and an increase in the percentage of morphologically abnormal spermatozoa. After the end of the treatment the male sexual behavior as well as the values for semen characters returned to normal.

The present investigation was planned to study the relative weight gain, semen characteristics and hormonal value in Friesian growing bulls supplemented with potassium iodine.

Materials and Methods

The present study was carried out on a total of 10 clinical healthy Friesian bulls, aged 14-18 months weighed 280-426 kg (367.3±46.31 kg) at the beginning of the experiment and localized in a private farm at Dakahlia Province. The study started on 7 October 2002 and ended on 7 January 2003. All bulls under investigation were left in free yard, under the same nutritional and managemental measurements. The bulls were examined to approve their healthy condition all over the period of the investigation. They were under strict program for controlling of internal and external parasites.

Chest circumferences were measured weekly and used as a screening method for measuring body weight changes according to the method described *(7).* The bulls were allotted into two comparable groups, treated group (supplemented by potassium iodide, n = 6) and untreated one (served as control; n = 4). Age/months and body weight of selected bulls are shown in table (1). The potassium iodide solution used in this study was prepared by dissolving 0.5 gm potassium iodide in 400 ml water; each ml of the solution contained 960 µg iodine. Each bull within the treated group was supplemented with potassium iodide per os through the drinking water in a dose of 960 µg iodine/head/day *(8),* all over the experimental period. Semen collection was carried out as usually in the morning by means of artificial vagina used a teaser bull for mounting. Following one false mounting one ejaculate collected once weekly from each bull. Immediately after collection, the semen samples were examined. The volume of the ejaculate was directly measured using transparent graduated test tube. Individual motility were assessed in semen diluted 1:1 with 2.9% sodium citrate solution. The percent of forward motility was recorded *(9).* Packed cell volume was determined for viewing sperm cell concentration *(10).* Freshly collected semen was stained by eosin-nigrosin stain, *(11),* viability percent. Smears were prepared and stained by alkaline methyl violet stain, individual and total abnormalities were calculated *(12).* Initial fructose was estimated in by spectrophotometer according to the method of *(13).*

Approximately 10 ml of blood were collected from each bull after every ejaculation by jugular vein puncture in dry, sterile vacutainer tubes. Blood samples were collected at morning (9.30-10.30 AM) and transferred to the laboratory in an ice container box. Plasma was separated by centrifugation at 3000 rpm for 15 minutes. The plasma was stored frozen at -20ºC until hormonal analysis. Plasma testosterone, T_3 and T_4 concentrations were determined by ELIZA method using kits from, DIAMETR, Gasibaladi, Segrate, Italy; Diagnostic Systemic Laboratories, Inc, USA; Biocheck Inc, Buslingame. The data of weight changes, semen evaluation, hormonal assay, for each animal either treated or untreated were

recorded and analyzed statistically by analysis of variance (ANOVA).

Results

From table (1) it was observed that the mean values of weight are (389.45±57.20 kg vs. 424.13±34.13 kg) for iodine supplemented and control groups, respectively. However, the mean values of relative weight gain are (4.98±2.60% vs. 2.70±0.72%) for the two groups, respectively. These values are significantly varied ($P<0.05$).

Table (2) showed the mean values for ejaculate volume, packed cell volume, individual motility, live sperm, initial fructose concentration and total abnormalities were (4.20±1.08 ml, 5.56±2.8%, 65.70±10.15%, 59.22± 8.04%, 128.50±83.13 mg/l00ml semen and 16.17±7.78%) for iodine supplemented group and were (3.43±1.20 ml, 3.90±1.17%, 44.80±14.60%, 55.00±14.30%, 68.69±59.38 mg/l00 ml semen and 18.30±8.0%) in control one, respectively. The initial fructose concentration as well as the individual motility values were significant higher ($P<0.05$) in treated group than in control one. Moreover the ejaculate volume in first group was significantly higher ($P<0.05$) than the second one. In addition there was a significant ($P < 0.05$) increase in testosterone level in iodine supplemented group (2.63±2.456 ng/ml vs. 1.1±1.04 ng/ml) in control ones. Value for T_3 level was (47.92±17.3 ng/ml) for iodine supplemented group, where it was (29.49±9.89 ng/ml) for there control one. The variation was significantly varied ($P<0.05$).
Moreover, mean value for T_4 was 5.61±2.30 and 4.03±0.63 ng/ml for the iodine supplemented and the control group, respectively. There was significant increase ($P<0.05$) in the T_4 level between the two groups (Table, 3).

Table 1: Age/months, body weights/kg and relative weight gain percent/kg for iodine supplement and control yearling Friesian bulls.

Bull groups	Treated group (iodine supplemented)						Untreated group (control)			
Bull number	T_1	T_2	T_3	T_4	T_5	T_6	C_1	C_2	C_3	C_4
Age/month	15	11	15	11.5	12	13	14.5	14	15.5	15
Body weight/kg	426	335	335	280	325	384	358	390	414	426
Mean weight before treated	347.5±46.31						397.0±25.98			
Mean weight after treated	389.45±57.20						424.13±34.13			
	T. value 2.03 *									
RWG %	4.98±2.60						2.70±0.72			
	T. value 2.73 **									

* Significant at probability < 0.05. ** Significant at probability < 0.01

Table 2: Mean ± SD values of semen characteristics for iodine supplemented and control yearling Friesian bulls.

Bull group / Semen characteristics	Treated bulls		Control bulls		t-value
	Mean	SD	Mean	SD	
Ejaculate volume/ml	4.20	1.08	3.43	1.20	1.880*
Packed cell volume %	5.56	2.8	3.9	1.17	1.580
Individual motility %	65.70	10.15	44.80	14.60	3.770**
Live sperm%	59.22	8.04	55.00	14.30	0.920
Initial fructose conc. mg/100	128.50	83.13	68.69	59.38	2.60**
Total abnormalities %	16.17	7.78	18.30	8.00	0.5
Head abnormalities %	4.30	2.08	5.70	2.40	1.20
Tail abnormalities %	6.07	1.90	6.90	2.50	0.75
Detached head %	5.80	3.80	5.50	3.10	0.22

* Significant at P < 0.05. ** Significant at P < 0.01

Table 3: Mean ± SD values of hormones for Iodine supplemented and control yearling Friesian bulls.

Bull group	Treated bulls		Control bulls		T-value
Hormones	Mean	SD	Mean'	SD	
Testosterone (ng/ml)	2.63	2.456	1.1	1.04	2.71**
T_3 (ng/ml)	47.92	17.29	29.45	9.88	2.79**
T_4 (ng/ml)	5.61	2.30	4.03	0.63	1.8*

* Significant at probability < 0.05 ** Significant at probability < 0.01

Discussion

From the previous result (Table 1), it was observed that the mean values for relative weight gain for the iodine treated group (4.98±2.60%) was significantly (P<0.01) higher than the control one (2.70±0.72%). Regarding the effect of iodine on body weight gain, the significant increase in the iodine treated group was agreed to that reported by *(14)*, who found that the influence of iodine supplement on growth was only detected in very young animals.

Concerning the effect of iodine on ejaculate volume, for the supplemented group (4.20±1.08 ml) vs. non treated one (3.43 + 1.20 ml) was agreed to those obtained by *(4&5)* who reported that supplement potassium iodide to bulls improved the ejaculate volume. Data in the present study revealed a significant increase in the individual motility of bulls supplemented with iodine (65.70±10.15%) vs. the non treated ones 44.80±14.60%. Similar findings were obtained by *(15&16)* who demonstrated that bulls received potassium iodide had significant increased sperm motility.

The non significant increase in PCV (5.56±2.80% vs. 3.90±1.17%) agreed with that reported by *(17&5)* who found that supplement potassium iodide had non significant effect on sperm cell concentration in bulls. Regarding the effect of iodine on the percent of live spermatozoa, there was non significant increase (59.22±8.04% vs. 55.00±14.30%). This came in accordance with *(5)*, who observed an improvement in semen quality of bulls after supplemented potassium iodide. The non significant decrease in the percentage of total sperm cell abnormalities in bulls supplemented with iodine (16.17±7.78%) vs for the non treated bulls (18.30±8.0%). Moreover, the obtained results were supported by

(18), who reported that there was non significant effect of the level of protein on abnormal sperms.

The significant improvement of initial fructose concentration in bulls supplemented with potassium, iodide (128.50±83.13 mg/100 ml semen vs 68.69±59.38 mg/100 ml semen for the non treated bulls) was nearly similar to the finding of *(5&17)*, who observed an improvement in semen fructose content in bulls received potassium iodide. This result may be attributed to the higher level of testosterone in blood *(19)* and testosterone hormone stimulates the secretory activity of the seminal glands. Regarding the effect of iodine on serum T_3 level, there was a significant increase in the serum T_3 in bulls supplemented with potassium iodide (47.92±17.29 ng/ml serum vs. 29.59± 9.88 ng/ml serum control ones). This elevation may be attributed to the fact that total concentration of iodine in the thyroid varies widely with the iodine intake *(20)* and the supplement additional amount of iodine may result in additional secretion of thyroid hormones, as the thyroid gland is able to accumulate this iodine in greater quantities and combine it into thyroxine *(21&22).* There was a highly significant increase in serum T_4 level in bulls supplemented with potassium iodide (5.61±2.30 ng/ml) as compared to the control ones (4.03±0.63 ng/ml). This observation may be attributed to the fact that the supplement of additional amount of iodine resulted in additional secretion of thyroid hormones, as the thyroid gland is able to accumulate it into thyroxine *(22).*

It could be concluded that supplement potassium iodide to bulls have a beneficial effect on semen quality and quantity, initial fructose concentration also it improves the endocrinological output of hormones on the other hand it has a positive relationship with growth and maturation.

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تأثير إضافة الأيودين على الرغبة الجنسية وخصائص السائل المنوى لذكور الفريزيان النامية

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أجرى هذا البحث على عشرة طلائق أبقار فريزيان تراوحت أعمارها بين 14-18 شهراً وعند بدأ التجربة كانت أوزانها تتراوح بين 280-426 كجم، تم اختيار 6 طلائق عشوائياً أعطيت يودور البوتاسيوم فى مياه الشرب عن طريق الفم كجرعة يومية تعادل 960 نانوجرام يود/رأس/يومياً طول فترة التجربة وتم ترك الأربع طلائق الأخرى كضابط للتجربة. ثم أخذ مقياس الصدر أسبوعيا كمقياس لوزن الطلوقة. ولقد لوحظ زيادة فى أوزان الطلائق التى أعطيت يودور البوتاسيوم زيادة ملحوظة عن غير المعالجة (4.98±2.60) فى المعالجة و (2.60 ± 0.72) فى غير المعالجة أسبوعيا. حجم القذفة، حجم الحيامن ٪، الحركة الفردية للحيامين، نسبة الحيامين الحية إلى الميتة، تركيز الفركتوز وإجمالى الحيامين المشوهة (4.2 ± 1.08 مليمتر، 5.56 ± 2.8٪، 65.70 ± 10.1٪، 59.22 ± 8.04٪، 128.50 ± 83.13 ملجم/100 ملى من القذفة 14.17 ± 7.78٪) فى الحالات المعالجة بيودور البوتاسيوم (3.43 ± 1.2 مليمتر،3.9 ± 1.17٪، 44.8 ± 14.80٪، 55.00 ± 14.30٪، 68.69 ± 59.38 ملجم/100 ملى من القذفة ، 18.35 ± 8.00٪) فى الحالات الغير معالجة والمتبقية كضابط. ووجد أن هناك زيادة معنوية فى هرمون الذكورة (التستستيرون)، T_3 ، T_4 فى المعالجة مقارنة بالمجموعة الضابطة.

من هذه الدراسة يمكن أن نستنتج أن إضافة مركبات اليود إلى مياه الشرب له تأثير فعال وايجابى على خواص السائل المنوى كما ونوعاً. لذا توصى هذه الدراسة باستخدام مثل هذه العلاجات لتحسين الكفاءة التناسلية لطلائق الأبقار.