Dept. of Theriogenology,
Fac. of Vet. Med., Assiut University,
Head of Dept. Prof. Dr. M Abdel-Raouf.

EFFECT OF SEASONAL VARIATIONS ON THE CHARACTERISTICS OF SEMEN COLLECTED BY EXHAUSTION TRIAL

(With One Table)

By

A.M. OSMAN; M.A. EL-NAGGAR; N.H. SALEH and A. Kh. ABDEL-RAZEK

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تأثير الإختلافات الموسمية على خواص السائل المنوى الذى جمع بواسطة الإجهاد الجنسى

ممدوح عثمان ، محمود النجار ، نتأت صالح ، عبدالرازق خليفة

١) أجرى هذا البحث لبيان تأثير الإختلافات الموسمية على خواص السائل المنوى الذى جمع بواسطة الإجهاد الجنسى ٠ ٢) أجرى هذا البحث على عدد ٨ طلائق بقرية مختلفة في العمر وفي السلالة ٠ ٣) تم تجميع السائل المنوى بواسطة الإجهاد الجنسى مرة كل إسبوعين في خلال موسم العليقة الجافة وموسم العليقة الخضراء ٠ ٤) أوضحت النتائج زيادة معنوية جداً (١٪) في تركيز الحيوانات المنوية في موسم العليقة الخضراء عنه في موسم العليقة الجافة ٠ ٥) أوضحت نتائج التحليل الإحصائى زيادة معنوية (٥٪) في عدد الحيوانات المنوية الغير ناضجة في موسم العليقة الجافة عنه في موسم العليقة الخضراء ٠ ٦) أوضحت النتائج أن باقى مواصفات السائل المنوى لم تظهر أى فروق معنوية خلال موسمى العليقة الجافة والعليقة الخضراء ٠

SUMMARY

The effect of season on the characters of semen collected by exhaustion trial was studied in 8 bulls with varying ages and breeds. Semen collection by exhaustion trial was repeated every two weeks within each of the dry and green season. The obtained results showed that, the sperm cell concentration ($10^6/mm^3$) was 0.560 and 0.864 in the dry and green seasons respectively. The difference was statistically significant ($P/\underline{0.01}$). Moreover, the protoplasmic droplet percentages were 3.34 and 1.96 in the dry and green seasons respectively. Statistical analysis of the obtained data revealed a significant difference ($P/\underline{0.05}$). However, the obtained results concerning total sperm count ($X\ 10^9$); mass activity; percentages of individual motility; alive sperm and abnormal sperm; pH; fructose (mg/100 ml), and reaction time (in seconds) showed a non significant variations with better improvements during the green season.

INTRODUCTION

The effect of season on the characteristics of semen was studied by several authors. Concerning semen volume, VARAKSA (1967) and NISHIYAMA et al. (1968) found that in bulls the differences in semen volume varied significantly with the different seasons. SALEM et al. (1973) reported that, the highest average semen volume was in winter while in spring the alive sperm percentage was the lowest. With regard to sperm cell concentration and total sperm count, VARAKSA (1967) cited that, the sperm concentration of cattle semen was significantly greater in winter than in summer. KUMI-DIAKA et al. (1981) demonstrated that, during the hot periods, the exotic breed bulls showed a significant lower sperm cell concentration and alive sperm percentage, RADEV et al. (1966) concluded that, sperm motility was greater in winter than any other season. SINHA and PRASAD (1966) demonstrated that alive spermatozoa did not vary significantly between seasons. Regarding the percentage of abnormal spermatozoa, NAGY (1965) reported that it was lowest in August and increased progressively with age. SALEM et al. (1973) cited that the greatest sperm abnormalities were found during spring season.

Concerning the pH, SALEM et al. (1973) found that the pH of cattle semen did not vary greatly with the different seasons. Regarding fructose and reaction time, MOULE et al. (1966) found that, the seasonal changes in concentration of fructose in rams were caused by a combination of sesonal factors affecting the quantity and quality of the forage available to the grazing animals. SANDBY and TOLLMAN (1978) recorded a seasonal variation in the level of testosterone in bulls. OSMAN et al. (1983) reported a higher level of testosterone in summer than winter in adult buffalo bulls. OSMAN et al. (1990) demonstrated a higher level of testosterone in the dry than green season in bulls.

The aim of this work was to study the effect of seasonal variation on the characters of semen collected by exhaustion trial.

MATERIAL and METHODS

The present work was carried out on 8 bulls with varying ages and breeds. These bulls included one Balady (12 years old), three Friesians (5.5-6.5 years-old) and four growing Cross Balady X Friesian breeds (13-16 months old). Four of these animals were kept at the clinic of the Department while the other four were kept at El-Awamer dairy farm in Assiut Province. During the present work, the bulls were kept under the same nutritional and managemental conditions.

Semen characteristics :

Semen was collected using the artificial vagina until the bull refused to mount. The trial was repeated every two weeks within each of the dry and green seasons. The reaction time was recorded in seconds. The teaser used was either a bull or a female.

Macroscopical examination :

Volume: The volume of the ejaculate was measured using a sterile graduated glass centrifuge tube.

pH: The hydrogen ion concentration of the samples was measured directly after collection by a pH paper (MERCK).

Microscopical examination :

Mass activity: It was estimated according to MILOVANOV (1962).

The individual sperm motility: The percent of spermatozoa exhibiting forward motility was recorded according to LAING (1979).

The sperm cell concentration: The sperm cell concentration ($10^6/mm^3$) was carried out by means of the Thoma ruling Neubauer haemocytometer (LAING, 1979).

Live sperm percentage: The alive sperm percentage was determined in smears stained by eosin-nigrosin where 200 sperm cells were counted and sperms with partially or completely stained heads were considered dead (BEARDEN and FUQUAY, 1980).

Abnormal sperm percent: The percent of abnormal spermatozoa was determined in smears stained by eosin-nigrosin stain, where 200 sperm cells were investigated using the oil immersion lens (ROBERTS, 1982).

Immature sperm percent: The percent of immature spermatozoa was estimated in smears stained with Indian ink by counting 200 sperms using the oil immersion lens (LAING, 1979).

Determination of the intial fructose: Fructose was determined in each semen sample (mg/100 ml) according to the method of MANN (1946).

The obtained data were statistically analysed according to SNEDECOR and COCHRAN (1967).

RESULTS

The obtained results of the mean values of semen characteristics during the dry and green season (two trials in each season) are presented in table (1).

It was found that the sperm cell concentration increased markedly ($P/ 0.01$) in the green than in the dry season and the percentage of immature spermatozoa showed a significant increase ($P/ 0.05$) in the dry than in the green season. However, the other semen characters showed a non significant variations with better improvements during the green season especially with regard to the total sperm count, mass activity, protoplasmic droplet, individual motility and alive sperm percentages.

DISCUSSION

Concerning semen volume our data showed a higher mean volume in summer than in green season which differ from the findings of VARAKSA (1967) and NISHIYAMA et al. (1968) who found a significant difference in semen volume with the different seasons. In addition SALEM et al. (1973) reported that, the highest average semen

volume was in winter. The increase in serum testosterone level during the dry season (OSMAN et al., 1983 and OSMAN et al., 1990) may be the cause of seminal gland activity which is reflected by an increase in the mean total volume of semen in the dry (34.95±6.70 ml) than in the green season (29.0±4.33 ml).

The sperm cell concentration showed a highly significant increase ($P < 0.01$) in the green (0.864±0.113 million/mm^3) than in the dry season (0.560±0.056 million/mm^3) these results agree with finding of VARAKSA (1967) and KUMI-DIAKA et al. (1981) who reported a significant increase in sperm cell concentration in winter than in summer. The total sperm count ($X\ 10^9$) was greater in the green season than in the dry one but with a non significant manner this increase may be attributed to the increased sperm cell concentration in the green season.

The motility percentage of spermatozoa which showed a non significant increase in the green (73.01±1.95) than in the dry season (72.05±2.76) coincides with that reported by RADEV et al. (1966) and SALEM et al. (1973). They concluded that, sperm motility was greater in winter than any other season. The percentage of live sperms was slightly greater in the green season (72.81±1.96) than in the dry one (70.06±1.72). These findings are in agreement with those of SINHA and PRASAD (1966) and KUMI- DIAKA et al. (1981). However, this result was in contrast with that obtained by SALEM et al. (1973).

The abnormal spermatozoa percentage showed a non significant increase in the green (9.25±0.83) than in the dry season (8.72±0.74). These results agree with those obtained by NAGY (1965) and SALEM et al. (1973). The percentage of immature spermatozoa showed a significant increase ($P < 0.05$) in the dry (3.34±0.80) than in the green season (1.96±0.24) and this may be attributed to the increased number of ejaculates obtained during exhaustion during the dry season than the green one.

The pH values which showed a non significant variation between the dry (6.94± 0.06) and the green season (6.74±0.11) agrees completely with finding of SALEM et al. (1973). The fructose concentration (mg/100 ml) also showed a non significant variation between the dry (537.33±71.61) and the green season (587.93±61.21). These results coincide with findings of MOULE et al. (1966).

With regard to the reaction time (in seconds) it showed a non-significant variation between the dry (168.39±30.27) and the green season (227.01±43.84). The low reaction time in the dry season seems to be attributed to the increased testosterone level in the dry than in the green season (OSMAN et al., 1983 and OSMAN et al., 1990).

In conclusion the results of the present study indicated that, the highest values of most semen characteristics which were obtained during the green season, may be due to the marked improvement in spermatogenesis as a result of good nutritional conditions of the animals in addition to the mild suitable weather prevailing such season.

SEASONAL EFFECT ON SEMEN COLLECTED BY EXHAUSTION

Table(1) : Mean values of semen characteristics during dry and green season (Mean for both exhaustion trials)

Semen charet-eristics	Unit	Dry season			Green season			"t" value
		No.of bull	No.of ej.	Mean ± S.E.	No.of bull	No.of ej.	Mean ± S.E.	
1-Total volume	ml	14	179	34.95 ± 6.70 (7.1 - 75.4)	9	84	29.00 ± 4.33 (13 - 52)	0.746 N.S.
2-Sperm concen-tration	10^6/ C.mm	14	170	0.560 ± 0.056 (0.030- 2.330)	9	79	0.864 ± 0.113 (0.095 - 2.360)	2.4104 **
3-Total sperm count	X10^9	14	170	19.842±4.36 (3.936-53.778)	9	79	27.38 ± 4.80 (3.895 - 48.753)	1.162 N.S.
4-Mass.activity	score (0-6)	13	160	3.62 ± 0.32 (1 - 5.07)	9	76	4.27 ± 0.29 (0 - 6)	1.505 N.S
5-Individual motility	%	13	146	72.05 ± 2.76 (30 - 90)	9	77	73.01 ± 1.95 (20 - 85)	0.284 N.S.
6-Alive sperm	%	13	152	70.06 ± 1.72 (40.14-90.51)	9	75	72.81 ± 1.96 (25 -91.54)	1.055 N.S.
7-Abnormal sperm	%	13	152	8.72 ± 0.74 (0 -21.33)	9	74	9.25 + 0.83 (1.26 - 14.4	0.4766 N.S.
8-Protoplasmic droplets	%	13	156	3.34 ± 0.80 (0 -16.67	9	76	1.96 ± 0.24 (0 - 6.39)	1.652 *
9-PH		14	182	6.94 ± 0.06 (6.0 - 8.2)	9	82	6.74 ± 0.11 (6.0 - 7.8)	1.596 N.S.
10-Fructose	mg/100 ml	14	171	537.33±71.61 (97.5 - 1280)	9	82	587.93±61.21 (142 - 1215)	0.53712 N.S.
11-Reaction time	seconds	14	182	168.39±30.27 (8 - 1311)	9	85	227.01±43.84 (4 - 1032)	1.100 N.S.

N.S : Non significant
* : Significant at 0.05
** : Highly significant at 0.01

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