Seasonal changes in FSH and testosterone in Shami bucks in Iraq

S. O. Hussain
College of Veterinary Medicine\ University of Baghdad

Abstract

The levels of FSH and testosterone were measured in sera of ten Shami bucks over a period of twelve months. Result showed that concentration of Follicular stimulating hormone (FSH) and Testosterone were increased significantly ($P<0.05$) during autumn and summer as compared to other seasons of the year. On monthly basis significantly ($P< 0.05$) higher concentration was observed during August, September and November for Testosterone. Furthermore, FSH shows highest concentration during October. These results indicate that the environment changes associated with seasonal changes affects the activity of the hypothalamic-testicular axis leading to a decrease or increase these hormones.

التغير الفصلي لهرموني المحفز لنمو الجريبات والتيستيستيرون في الماعز الشامي في العراق

سهيلة أونيس حسين
كلية الطب البيطري/ جامعة بغداد

الخلاصة

تم قياس مستوى هرموني المحفز لنمو الجريبات والتيستيستيرون في مصل من 10 ذكور ماعز شامي لفترة امتدت لـ 12 شهراً. أظهرت النتائج أن تركيز هرمون المحفز لنمو الجريبات وهرمون التستيستيرون ازدادت معنوياً ($P<0.05$) خلال فصلي الخريف والصيف مقارنةً مع بقية فصول السنة. أظهر تأثير الأشهر ارتفاعاً معنوياً ($P <0.05$) سجل خلال آب، أيلول و تشرين الثاني بتركيز هرمون التستيستيرون. في حين لوحظ أن هرمون المحفز لنمو الجريبات أرتفع تركيزه خلال شهر تشرين الأول. أكدت هذه النتائج تأثير تغييرات المحيط المترافقة مع تغيير الفصول في فعالية محور تحت المهاد–الخصية والتي أدت إلى ارتفاع أو انخفاض هذه الهرمونات.

Introduction

Productivity in small ruminants is affected by the seasonality of reproduction (1). It has been reported that different physiological functions a rise from seasonal changes in mammals through daily secretion of hormones (2). Specifically, hypothalamus and testes have been reported to be affected due to changes in melatonin level (3). An increase in the daily period of melatonin secretion is associated with an increase in gonadotrophic release and activation of the gonads in short day breeders (4). The decrease in quantitative and qualitative semen production and sperm fertility during the non-breeding season has been reported (5). Photoperiod or annual season has been suggested as the principal factor influencing seasonality of reproduction in bucks at high latitudes (6 and 7). Seasonal variations of fertility in goats are due to the change of day duration throughout the year (8). This determines the annual rhythm of hormonal secretion by the hypothalmo-hypophyso-gonadic axis, particularly the frequency of FSH, many goat breeds living in subtropical zones express seasonal variations of their sexual activity (9). FSH hormone has important role in the regulation of spermatogenesis, FSH secretion is under regulation by gonadal feedback effects (10). On the other hand, FSH secretion is influenced by both gonadal steroids and non

steroidal factors referred to as inhibin (11). Testosterone, the primary male hormone, is responsible for male sex characteristics (12). Testosterone levels were measured to provide an indicator of testicular activity in response to photoperiod treatment (13). In contrast, testosterone is likely to be the most potent gonadal factor regulating FSH secretion (10). Testosterone and FSH are required to obtain full reproductive potential. In the testis, somatic Sertoli cells transducer signals from testosterone and FSH into the production of factors that are required for sperm maturation (14). Nutrition is considered to be an important factor affecting seasonality of reproductive functions in bucks (15). In the Mediterranean area, the majority of goats are maintained in extensive or semi-extensive system, where food availability is highly dependent on the season. Hence, nutrition may be responsible for seasonal reproductive patterns (1). In view of this and since little information's are available concerning the various aspect of endocrine pattern in male goat in Iraq, this study was conducted, to through some light on the serum levels of FSH and Testosterone in different periods of the year.

Materials and Methods

This study had been conducted at Agarguf goat station, Baghdad city. In this study 10 (1.5-2 years old) Shami bucks were housed in semi opened shade, provided with concentrated diet given at rate of 0.75 Kg in two daily occasions supplemented with straw and green food. Bucks were subjected to careful clinical examination to ensure that they were in good health and not suffering from any disease. Blood samples was collected weekly by jugular vein puncture with vacutainer tubes through the year, the blood left to clot then centrifuged at 3000 rpm/10 minute, sera obtained were kept frozen (-20c^{o}) until used for hormonal determination. FSH and Testosterone activity was measured by radioimmunassy according to the methods of schanbache and Docchio (16). Analysis of variance and Duncan's multiple-range test were used for statistical analysis of data (17).

Results

The results showed the serum levels of FSH and testosterone in Shami during different months of a year. It has been found that values of FSH varied from (1.10±0.02 to 3.24±0.62 ng/ml) (Table 1 and Fig. 1), and testosterone 2.02±0.64 to 5.23±0.23 ng/ml (Table 2 and Fig. 2). Regarding seasonal changes, this study showed significant ($P<0.05$) highest concentration of FSH during autumn (2.66±0.47) and summer (2.21±0.17 ng/ml) in comparison with other season (Table 1 and Fig. 1). On monthly basis highest significant ($P<0.05$) value had been recorded in October (3.24±0.62 ng/ml) and the lowest in December, January and February in FSH hormone (1.10±0.02, 1.23±0.34 and 1.12±0.61 ng/ml) respectively (Table 1 and Fig. 2). Testosterone concentration in different months has been shown in Table 2 and Fig. 2, there was significant different ($P<0.05$) in their value in autumn (5.07±0.54 ng/ml), as compared with other season. The winter season showed the lowest value (1.15±0.32 ng/ml). with regarding the month, serum testosterone level showed higher significant difference ($P<0.05$) values in September, October and November (5.02±0.66, 4.98±0.74 and 5.23±0.23 ng/ml) (Table 2 and Fig. 2).

Table (1) Seasonality and monthly changes in FSH levels in the Shami bucks

Season	Winter			Spring			Summer			Autumn		
Months	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov
FSH	1.10 ± 0.02 e	1.23 ± 0.34 e	1.12 ± 0.61 e	1.54 ± 0.32 d	1.80 ± 0.41 c	1.92 ± 0.72 c	2.22 ± 0.01 b	2.31 ± 0.31 b	2.10 ± 0.21 bc	2.50 ± 0.72 b	3.24 ± 0.62 a	2.26 ± 0.08 b
Means	1.15±0.32 d			1.75±0.48 c			2.21±0.17 b			2.66±0.47 a		

- **The number represents mean ± SE.**
- **The similar small letters represent no significant differences.**
- **The different small letters represent significant differences at ($P<0.05$).**

Table (2)Seasonality and monthly changes in testosterone levels in the Shami bucks

Season	Winter			Spring			Summer			Autumn		
Months	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov
Testosterone	2.02 ± 0.64 f	2.04 ± 0.30 f	2.10 ± 0.81 ef	3.20 ± 0.24 d	2.41 ± 0.92 e	3.01 ± 0.11 d	4.21 ± 0.37 c	4.30 ± 0.26 c	4.82 ± 0.81 b	5.02 ± 0.66 a	4.98 ± 0.74 a	5.23 ± 0.23 a
Means	2.05±0.58 d			2.87±0.42 c			4.44±0.48 b			5.07±0.54 a		

- **The number represents mean ± SE.**
- **The similar small letters represent no significant differences.**
- **The different small letters represent significant differences at (P<0.05).**

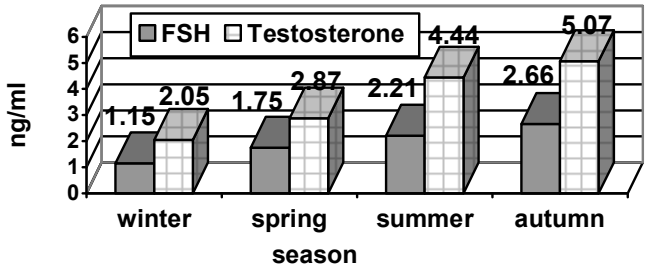

Fig. (1): Seasonal changes in FSH and testosterone in the Shami bucks

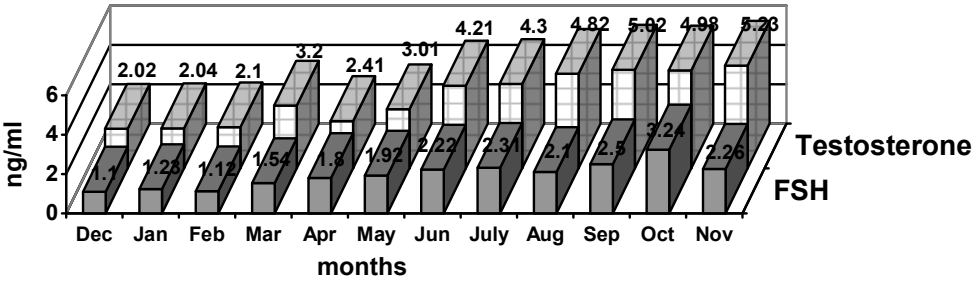

Fig. (2): Monthly changes in FSH and testosterone in the Shami bucks

Discussion

Hormonal changes obtained in this study (FSH and testosterone) indicate that there is a significant (P<0.05) increase in serum FSH and testosterone levels in autumn followed by summer. Various results indicate clearly that local bucks seem to have sexual activity all year around with relative seasonality in favor of summer and autumn when all sexual attributes markedly increased (18). Such hormonal picture has been suggested by Howe (19) in New Zealand bucks. Testosterone is the most important male reproductive hormone; it is related to reproductive behavior, spermatogenesis and secondary sexual characteristics (20). Blood testosterone concentrations are related to age (21), season of the year (22), protein intake (23) and luteinizing hormone (LH) pulse frequency (24). Testosterone is directly involved in the onset of puberty and consequently in the onset of spermatogenesis (25) and play physiological roles in the regulation of FSH secretion in the adult male goat (10). However, there is no consensus as to which is the most important puberty indicator (26). The present result indicated that there are significant differences between the seasons of the year. This is in agreement with the study of Illius et al. (27) who stated that the seasonal variability in testosterone levels has been reported. The results clearly indicate the position of light

sensitive phase during the light-dark cycle and further show that very short pulses or flashes of light received during this period are sufficient to entrain endogenous rhythms which participate in the regulation of testosterone secretion. This is in accordance with Schanbacher et al. (13) in sheep. This is agree with the finding of Schanbacher et al. (13). The changes of testosterone levels apparently represent an interaction between maturational and seasonal variables (27). This value of information in this study pertains to the finding that light pulses can be used to alter the endocrine system that affects reproduction. Similar observations have been reported by other worker (13). In addition, there is a high correlation between testosterone levels and semen characteristics (28). It was concluded that the testosterone levels could be a detrimental factor in semen assessment. This is similar to the finding of (28). Some investigations found high seasonal variation in sexual activity following the exposure to an estrous female (28). The decreased summer activity is a direct result of lowered testosterone or a combination of environmental and physiological factors (29). This might be duo to testosterone hormone can directly affect the process of spermatogenesis, as normal spermatozoa are directly under the influence of Sertoli cells which are responsible for sperm nourishment, division and caring (28). The testosterone concentration is influenced by an acute stress condition (temperature). This is in agreement with the finding of Grasselli et al. (30). However, other environmental stimuli, such as availability of food and social interactions, may be potential regulators of the seasonality of reproduction (31 and 32). However, since changes in photoperiod also occur during times of scarce nutrition, it is possible that season and nutrition have complex effects on reproductive activity (1) who demonstrate that a higher feeding level does not have an evident effect on the seasonality, but if the animals are in good nutritional condition outside the reproductive season, they would be more sexually active. It was concluded from this study that the level of FSH and testosterone increased significantly during summer and autumn.

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