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SEASONAL CHANGES ON REPRODUCTIVE PARAMETERS IN ALGERIAN REMBI RAMS

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ABSTRACT

This study was conducted to determine the effect of season on three main parameters of sexual activity in Rembi rams in Algeria during 12 months period. The experiment involved a monthly measurement of plasma testosterone (T) level, scrotal circumference (S.C) and body weight (B.W) in ten adult rams, aged between 2 and 6 years and raised under semi-extensive system, in permanent contact with the ewes. The data collected showed a significant effect of season on the parameters studied. The seasonal variations have showed higher values during spring and autumn with a maximum in April for the testosterone levels (3,45±0,14 ng/ml), in November for the scrotal circumference (34,7±2,00 cm) and the body weight (82,3±1,28 Kg). The lower values were recorded during periods of very high temperatures in summer, during food restriction periods and poor grazing in winter, with an annual minimum in June for the testosterone levels with 0,47±0,02 ng/ml and in July for the scrotal circumference (31,58 cm) and the body weight 80,93±1,20 Kg.

Keywords: Body weight; fertility; scrotal circumference; sexual activity; testosterone.

INTRODUCTION

The sheep herd represents the main animal resource in Algeria; Approximately 23 million heads of which 75% are concentrated in the steppe, and reared in extensive or semi-extensive system which are characterized by a strong dependence on natural vegetation and therefore highly influenced by climatic conditions [1]. Sheep farming is an important economic source through mixed production of meat, milk, leather and wool [2]. That is why improving the yield of our farms is paramount, this improvement involves first and foremost the reproduction, which is the key to the success of any breeding [3]. Apparently in order to achieve successful sheep productivity, herds must undergo the control breeding of the ram [4]. The Rembi breed represents 12% of the national sheep, and is one of the most interesting and important

Algerian breeds based on its physical, productive and reproductive skills by two lambs per year with a fairly acceptable twinning rate [3]. It is the biggest sheep in Algeria; the ram weighs 90 kg, while the weight of the ewe is 60 kg. The effectiveness of male reproduction is influenced partially by race and testicular size [5], and geographic location as well as season of the year [6].

According to the literature the breeds from temperate climates or high latitudes (> 35^{o}N) are seasonal breeders and the annual variation in daily photoperiod is responsible for timing the annual reproductive cycle [7], even when living in mid latitudes [8]. Therefore, yearlong comparative studies between breeding and non-breeding seasons in rams will be useful for completing the findings and reducing the reproductive challenges of these species [9].

In order to improve the reproduction and the production of this breed, this research investigated the changes of the most important physiolological parameters of the sexual activity during the year since they have a direct influence on the fertility of the rams.

MATERIALS AND METHODS

This study was carried out between January and December 2015, at the Cherif Eddine experimental farm in Souguer, 25 km far from the capital of the Tiaret provence in western Algeria (geographic coordinates: longitude 1°29'E, latitude 35°11'N, altitude 900 m.s.l). The climate is arid with cold and wet winter, and hot and dry summer; the temperature varies from -1,1 to 16,4°C in winter and from 21,9 to 39,5°C in summer. The daily photoperiod varies from 9,34 h during the winter solstice to 14,23 h during the summer solstice.

Ten rams of the Rembi breed, aged between 2 and 6 years with an average weight of 82 Kg and raised in a semi-extensive system, in permanent contact with the ewes, were chosen for this experiment. In addition to grazing on natural woody plants (Alpha, sagebrush, Atriplex).

These animals received a nutritional supplement of barley, corn, soybeans and hay, while water was provided *ad libitum.*

Three parameters were studied; the serum testosterone concentration, the scrotal circumference and the body weight. Monthly samplings of blood tests for each ram were performed to estimate the levels of this hormone. Testosterone was measured by radioimmunoassay method testosterone (RIA), direct REF 05200067 certified (*Cobas France*). The scrotal circumference was obtained by monthly measurements using a metric tape and the body weight was obtained by monthly weighing using an electric scale.

Statistical test and analysis of the data were carried out using the "R" software to determine seasonal and monthly variations of the three studied parameters for all subjects grouped together.

The data were tested by the Shapiro-Wilk normality test to determine whether they were normal and subsequently analyzed by the anova test; the results are significant when $P<0,01$.

When the data do not fit the law of normal, they are analyzed by the Kruskal-Wallis test; the results are significant when $P<0,05$.

RESULTS AND DISCUSSION

The results are pesented in the Table 1 ans 2. In this study, the pattern of testosterone level, scrotal circumference and body weight recorded in rams were similar to those reported by authors in other breeds [10,11,12,5], and for the same breeds with a strong correlation between the three sexual parameters [13,14,15].

According to our results, the season had a significant effect (P<0,05) on the fertility and the reproductive parameters of the Rembi rams. Various studies mentioned that the fertility of rams observed continuous seasonal changes [16,17].

In this work, the testosterone levels in rams during the four seasons of the year were higher during the months of October with 2,97±0,18 ng/ml and April with 3.45±0.14ng/ml, while the lowest values were observed in June 0,47±0,02ng/ml, July 0,5±0,02 ng/ml and January 0,6±0,03 ng/ml respectively.

The same observation was made for the scrotal circumference, while it varied significantly (P<0,05) during the different seasons of the year. The lower circonference were observed during the months of July 31,5±1.26 cm and August 31,9±1,40 cm, coinciding with the lower testosterone levels. Also, the highest circumference value was observed in November with 34,7±2,00 cm. The mean annual scrotal circumference rate in all Rembi rams used in this study was 33,18±0,92 cm.

Similar results were observed in northern sheep varieties in Turkey, with a maximal testicular androgenic activity during autumn and minimal in summer [18,19,20,21]. It has been suggested that stimulation of the pineal gland on the hypothalamic axis in the ram is more likely to begin in autumn when there is a decrease in ambient temperatures and a decrease in day length.

It has been reported that season has also an important impact on scrotal circumference in Suffolk rams with highest values in autumn [22] and spring [23]. In Karakul rams, the lowest value of the scrotal circumference is observed in winter and the highest value is observed in autumn [12]. It also has been observed seasonal variations of scrotal circumference in Awassi, Babolna Tetra, Barbados Blackbelly, and Tsigai breeds with minimum values in winter and spring and maximum values in summer and autumn [23]. According to another study [24], the testicular diameter values is lower in winter and increase in spring. These variations are comparable to those observed with the Texel ram [25] and the Ile-de-France ram [26]. Similar observations were observed on rams of other breeds in other regions, such as: Barbarin in Tunisia [27], Suffok in the USA [28], Pelibuey in Mexico [29] and Soay in Scotland [30].

Under our conditions of breeding, food availability being insufficient during the winter, this situation may explain the low values observed of the studied parameters during this period, giving the fact that several authors have already reported the effect of the undernourishment on the performances of reproduction in the ram [31,32]. The minimum values observed in our study in summer can be explained by the thermal stress generated by the high heat that exceeds 39°C in July. However, it was found that body weight is directly correlated with scrotal circumference so significantly influenced by the season [33].

Table 1. Mean±SD values for Monthly testosterone levels, scrotal circumference and body weight in Rembi rams

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
Testosterone (ng/ml)	0,60±0,03	1,2±0,07	2,38±0,12	3,45±0,14	1,87±0,06	0,47±0,02	0,50±0,02	0,6±0,03	2,33±0,12	2,97±0,18	2,04±0,12	0,69±0,04
Scrotal Circumference (Cm)	33,7±1,73	33,2±1,94	33,6±1,76	34,1±1,43	33,1±0,99	32,2±1,33	31,5±1,26	31,9±1,40	32,8±1,62	33,6±2,08	34,7±2,00	33,6±1,77
Body weigh (Kg)	81,6±1,15	81,4±1,44	81,6±1,35	81,7±1,25	81,8±1,27	81,4±1,17	80,9±1,20	81,0±1,03	81,5±1,16	82,0±1,31	82,3±1,28	82,1±1,24

Table 2. Mean±SD values for seasonal changes of testosterone levels, scrotal circumference and body weight of Rembi rams

	Spring	*Summer*	*Autumn*	*Winter*	*p*
Body weigh (Kg)	33,61±0,42	31,9±0,25*	33,72±0,78	33,46±0,28	0,03375
Scrotal circumference (Cm)	81,69±0,09	81,13±0,23*	81,96±0,35	81,72±0,28	0,02931
Testosterone (ng/ml)	2,57±0,81	0,52±0,07*	2,45±0,47	0,85±0,35	0,00172

** Indicates a significant diffrences in the same line respectively p<0,05*

CONCLUSION

Although the Rembi rams in the Tiaret region are sexually active throughout the year, their testosterone levels as well as their testicular and body sizes undergo seasonal variations due to heat stress, seasonal food restriction and photoperiod. In conclusion, spring and autumn are the periods most favorable to the reproduction of Rembi rams with the possibility of improving the fertility of animals during the rest of the year by improving the breeding conditions.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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