

EFFECT OF RACIAL CROSSING ON THE SEMINAL PARAMETERS OF RAMS SUBMITTED TO HEAT STRESS

EFEITO DA CRUZAMENTO RACIAL NOS PARÂMETROS SEMINAIS DE CARNEIROS SUBMETIDOS AO ESTRESSE DE CALOR

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ABSTRACT: The aim of this study was to evaluate the effect of racial crossing on seminal parameters of eight Santa Inês and crossbred (Santa Inês x Dorper) rams submitted to heat stress, and to monitor the return of these parameters to previously reported. Before to place the insulation bags, two collects of semen through electroejaculation were performed. The insulation pouches were made with double-layer plastic, internally lined with cotton, and fixed around the spermatic funiculus and scrotum with adhesive tape and bandage remaining on the testes of the animals for seven days. The first collect was performed on the day that the pouches were taken (day 0) and thereafter, every seven days, totalizing 15 measurements. Data were submitted to analysis of variance (ANOVA). The analyzed variables were subjected to Dunnett test at 5% probability to compare the values obtained before treatment with those obtained in the following days. In this study it was found that the animals restored normal seminal parameter after the insulation effects, however, the return rate differed slightly among the studied breeds. The crossbred animals restored the seminal patterns, on average, a week before Santa Inês. It is concluded that the racial crossing influences the semen parameters of rams submitted to heat stress.

KEYWORDS: Motility. Scrotal insulation. Sperm concentration. Sperm quality.

INTRODUCTION

The rams breeding is a practice present around the world. This practice has shown significant increase in recent years, especially in the effective herd and in the number of properties involved in this activity (BUENO et al., 2006). Due to productive potential, Santa Inês is the breed of rams which is most prevalent in the Brazilian Northeast. Mainly for its great adaptability, it can be used as a pure breed or for industrial crossings (SILVA; ARAÚJO, 2000).

The native breeds of rams from the Brazilian Northeast are adapted to the climatic conditions of this region, but there are barriers that impair productivity, especially the non-precocity and carcass quality. Considering these factors, industrial crossings are carried out in order to increase production (BARROS et al., 2005). For industrial crossings South African breeds such as the Dorper and native breeds are used. This is a strategy that increases the success of the activity, because environmental factors have many influences on animal production (SANTOS, 2006). One aspect that is influenced by environmental

factors is the sperm quality of the reproducers. According Gabaldi and Wolf (2006), elevation of the environmental temperature causes increase of testes temperature causing deleterious effects on spermatogenesis.

Due to the absence of studies based on the influence of racial crossing on the scrotum-testicular thermoregulation, this study aimed to perform a comparison between semen characteristics of rams Santa Inês and crossbred (Dorper x Santa Inês) submitted to scrotal insulation.

MATERIAL AND METHODS

Healthy eight rams (4 Santa Inês and 4 crossbred Santa Inês x Dorper), aged between 18 and 24 months were used. For the selection of animals, a general clinical examination, with emphasis on the reproductive system in order to verify the integrity of these organs through palpation was performed. The experiment was conducted in the experimental sheepfold of Piauí Federal University, Campus Professora Cinobelina Elvas at Bom Jesus, PI, Brazil between March and July months. This town is located at 09°04'28" of

South latitude, 44°21'31" of West longitude and 277 meters of altitude. During the experiments, animals had elephant-grass based diet (*Pennisetum purpureum*) and were supplemented with commercial feed for rams, mineral salt and water *ad libitum*. During experimental period, animals were confined.

The insulation pouches were made with double-layer plastic, internally lined with cotton, and fixed around the spermatic funiculus and scrotum with adhesive tape and bandage remaining on the testes of the animals for seven days. Before placing the insulation bags, two collects of semen through electroejaculation were performed, in order to determine the baseline parameters and seminal morphophysiological characteristics of each group, with seven days of interval. Seminal parameters evaluated were the volume, in mL, the vigor and turbulence on a scale of from 0 to 5, motility (0-100%) and the concentration ($\times 10^9$ spermatozoa per mL) with a Neubauer counting chamber. After insulation, these same parameters were measured.

Before each collect, the prepuce of the animals has been sanitized to remove impurities. Feces were removed to improve electrode contact with the rectal wall. The electroejaculator used had a probe with three transversal electrodes, which were placed in contact with the ventral rectal wall.

The first collect was performed on the day that the pouches were taken (day 0) and thereafter, every seven days, totalizing 15 measurements. The data were submitted to analysis of variance (ANOVA) for a randomized block design, with two blocks, 15 treatments and four repetitions. The analyzed variables were subjected to Dunnett test at 5% probability to compare the values obtained

before treatment with those obtained in the following days.

RESULTS AND DISCUSSION

The seminal characteristics of the studied animals are shown in Table 1. Before treatment, the average volume of ejaculate from Santa Inês and crossbred was 0.6 ± 0.1 mL and 0.8 ± 0.2 mL, respectively. After insulation this parameter was the only one that did not change ($P > 0.05$). These data are similar to those found by Garcia et al. (2010) and also by Moreira et al. (2001) and Santos and Simplício (2000), whom concluded that there was no change in ejaculate volume after induction of heat stress by the use of scrotal insulation in buffaloes, rams and goats.

The average values for motility before treatment were $63.8 \pm 6.3\%$ and $69.4 \pm 8.3\%$ for Santa Inês and crossbred, respectively. The insulation caused a significant reduction ($P < 0.05$) of motility after the seventh day post-insulation in all animals evaluated. According Gabaldi and Wolf (2002), the temperature increase in the testes causes a decrease in sperm motility. Similar results for the present study were verified by Moreira *et al.* (2001), whom reported that on the 14th day no living sperm was found in samples, and this condition persisted during the subsequent 21 days. In current study, at day 49 in Santa Inês rams and at day 35 in crossbred group (Table 1), the first mobile sperm was observed in the ejaculate, but these values also revealed a significant difference ($P < 0.05$) compared to pre-insulation values. Regarding the sperm motility, the return to normality was observed at day 70 in Santa Inês rams and at day 63 in crossbred animals.

Table 1. Seminal parameters ($\bar{x} \pm dp$) of Santa Inês and crossbred rams (Santa Inês x Dorper) submitted to scrotal insulation process for seven days.

	Breed									
	Santa Inês					Crossbred				
	Vol ¹	Mot ²	Conc ³	Turb ⁴	Vig ⁵	Vol ¹	Mot ²	Conc ³	Turb ⁴	Vig ⁵
Before	0.6±0.1	63.8±6.3	1.26±0.41	2.4±0.5	2.8±0.4	0.8±0.2	69.4±8.3	1.44±0.42	2.8±0.6	2.8±0.6
0	1.1±0.5	50±20	1.53±0.58	1.8±0.8	2.0±1.0	1.0±0.5	35±20	0.90±0.55	1.3±0.8	1.8±0.8
7	1.4±0.2	2.5±3.8*	1.10±0.80	1.4±0.2*	0.5±0.8*	0.8±0.4	0.5±0.8*	0.58±0.43	0*	0*
14	0.8±0.4	0*	0.38±0.18*	0*	0*	0.9±0.3	0*	0.33±0.33*	0*	0*
21	0.8±0.3	0*	0.05±0.03*	0*	0*	1.4±0.4	0*	0.05±0.03*	0*	0*
28	1.6±1.2	0*	0.01±0.00*	0*	0*	0.6±0.2	0*	0.01±0.00*	0*	0*
35	0.5±0.2	0*	0.30±0.35*	0*	0*	0.8±0.2	2.8±3.6*	0.01±0.01*	0*	0.3±0.4*
42	1.3±0.7	0*	0.01±0.00*	0*	0*	1.0±0.5	22.5±17.5*	0.04±0.03*	0*	0.8±0.4*
49	0.8±0.1	8±7*	0.15±0.10*	0*	0.8±0.4*	0.9±0.2	10±5*	0.04±0.03*	0*	0.8±0.4*
56	0.7±0.2	20±15*	0.09±0.06*	0.3±0.4*	1.3±0.4	0.7±0.2	25±20*	0.03±0.03*	0.8±0.8	1.0±0.5
63	0.7±0.1	20±10*	0.17±0.09*	1.3±0.4	1.0±0	0.7±0.3	55±30	0.40±0.20	1.8±1.3	2.0±1.5
70	1.4±0.3	42.5±17.5	1.28±0.63	2.3±1.3	2.3±0.8	1.0±0.3	52.5±26.3	0.76±0.49	2.5±1.3	2.0±1.0
77	1.0±0.3	62.5±12.5	1.35±0.70	2.5±1.0	2.8±0.4	1.5±0.5	60±15	1.03±0.54	2.8±0.9	2.3±0.9
84	1.3±0.5	70±15	1.28±0.83	2.5±0.3	2.8±0.4	1.4±0.7	62.5±8.0	1.13±0.54	2.3±0.8	2.8±0.8
91	0.8±0.2	67.5±17.5	1.12±0.93	2.0±1.5	2.0±1.0	1.3±0.7	72.5±12.5	1.25±0.95	1.8±1.8	2.3±1.3
Total	1.0±0.3	23.4±22.9	0.67±0.57	1.1±1.0	1.3±1.0	1.0±0.2	31.2±25.2	0.52±0.46	1.1±1.0	1.3±1.0

*statistical difference ($p < 0.05$). ¹volume (mL); ²motility (%); ³concentration ($\times 10^9$ spermatozoa/mL); ⁴turbulence (0-5); ⁵vigor (0-5).

The insulation caused significant decrease in vigor and turbulence in all animals studied from the seventh day post-insulation. For the vigor, the difference in relation to pre-insulation values was observed until day 49 and the return to normal parameters was observed in day 56 in both breeds. For the turbulence, the return occurred at 63rd day in Santa Ines and at 56th day in the crossbred animals. So, the return of turbulence parameters in crossbred was faster than in the Santa Inês rams.

According to Maia et al. (2011), the crossbred rams have better semen quality than pure breeds. Among the seminal characteristics affected by temperature, the motility, vigor and concentration are those that suffer major effects due heat stress (MOREIRA et al., 2001).

Before insulation, the average concentration of sperm from Santa Inês and crossbred was $1.26 \times 10^9 \pm 0.41$ and $1.44 \pm 0.42 \times 10^9$, respectively (Figure 1).

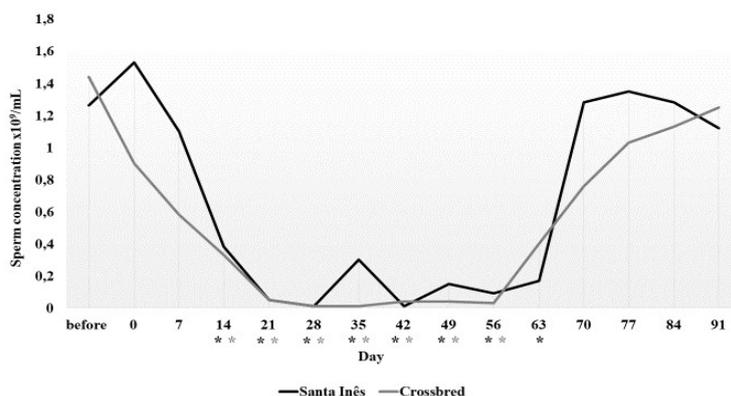


Figure 1. Sperm concentration of rams submitted to scrotal insulation. *differs statistically of before day ($p < 0.05$). Note that crossbred return to seminal parameters before Santa Ines rams.

These data are in agreement with the Brazilian College of Animal Reproduction, that establish to the seminal patterns for rams (CBRA, 2013). All animals studied suffered significant decrease in sperm concentration 14 days after to scrotal insulation (Table 1).

In Santa Inês rams, the concentration showed recovery only from day 70, but crossbred had a faster return of concentration at day 63, that is, a week earlier. Most semen parameters in rams may differ among breeds (COSTA et al., 2009).

The changes in sperm quality, resulting from thermal stress were also found by other authors (SABÉS-ALSINA et al., 2016; ROCHA et al., 2015; RAHMAN et al., 2014). However, the

deleterious effects of insulation may be reversible, showing the seminiferous epithelium resistance to increased testicular temperature (MOREIRA et al., 2001).

In the current study it was found that the animals recovered from the insulation effects. However, the return rate differed slightly among the studied breeds, and the crossbred restored the seminal patterns, on average, a week before the rams Santa Ines.

CONCLUSION

The racial crossing influences the semen parameters of rams submitted to heat stress.

RESUMO: O objetivo deste estudo foi avaliar o efeito do cruzamento racial sobre parâmetros seminais de oito carneiros Santa Inês e mestiços, submetidos ao estresse térmico e monitorar o retorno desses parâmetros aos relatos anteriormente. Antes de colocar as bolsas de insulação, foram realizadas duas coletas de sêmen por meio de eletroejaculação. As bolsas de insulação foram confeccionadas com plástico de camada dupla, revestidas internamente com algodão, fixadas ao redor do funículo espermático e escroto com fita adesiva e bandagem, permanecendo nos testículos dos animais por sete dias. A primeira coleta foi realizada no dia em que as bolsas foram retiradas (dia 0) e a partir daí, a cada sete dias, totalizando 15 coletas. Os dados foram submetidos à análise de variância (ANOVA). As variáveis analisadas foram submetidas ao teste de Dunnett a 5% de probabilidade para comparar os valores obtidos antes do tratamento com aqueles obtidos nos dias seguintes. Neste estudo verificou-se que os animais restauraram os parâmetros seminais normais após os efeitos

da insulação, porém, a taxa de retorno diferiu ligeiramente entre as raças estudadas. Os animais mestiços restauraram os padrões seminais, em média, uma semana antes da Santa Inês. Conclui-se que o cruzamento racial influencia os parâmetros seminais de carneiros submetidos ao estresse térmico.

PALAVRAS-CHAVE: Motilidade. Concentração espermática. Insulação scrotal. Qualidade seminal.

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