Modifications of some rabbit spermatic parameters in relationship to high ambient temperatures

Finzi A., Morera P., Macchioni P.

in

Baselga M. (ed.), Marai I.F.M. (ed.).
Rabbit production in hot climates

Zaragoza : CIHEAM
Cahiers Options Méditerranéennes; n. 8

1994
pages 333-336

MODIFICATIONS OF SOME RABBIT SPERMATIC PARAMETERS IN RELATIONSHIP TO HIGH AMBIENT TEMPERATURES *

Finzi A., Morera P., Macchioni P.

Unconventional Rabbit-Breeding Experimental Centre,
Animal Husbandry Institute
Tuscia University, Viterbo, Italy

Abstract

To evaluate volume and concentration of semen in hot environmental conditions, ten N.Z.W. rabbit bucks, selected for homogeneous sperm output (ml 0.6 ± 0.1) with artificial vagina, were located into a climatic chamber. Semen collection, by two consecutive ejaculations, was performed three times a week.

Mean pre-trial ambient temperature was 20.3°C ± 1.1 and relative humidity was 69.1% ± 3.5. The animals were then exposed for two months to a mean ambient temperature of 29.8°C ± 0.6 and relative humidity of 67.9% ± 1.7 with a daily remission for three hours to ambient temperature of 24.7°C ± 0.8; relative humidity 72.5% ± 6.0.

Total volume had a mean value of ml 1.10 ± 0.29 in the pre-stress period, and underwent a not significant increase to ml 1.23 ± 0.28 from 2nd to 9th week.

Any difference was observed in the pre-trial period and in the first week of treatment between first and second ejaculation of each semen collection. The difference appeared and became statistically significant starting from the second week ($P<0.05$). This difference was due to an increase of the volume in the first ejaculation (from ml 0.56 ± 0.20 to ml 0.67 ± 0.21 in the pre-trial period and in the hot period respectively, + 19.6%; $P<0.05$) since the volume of second ejaculation showed not significant variations.

The output of spermatozoa per ml ($x10^6$) was 107.2 ± 50.9 in the pre-stress period. It showed a quick increase (185.5 ± 98.1; + 73.1%; $P<0.01$) in the first weeks of stress then it stabilized itself at an intermediate value (156.2 ± 91.5; + 45.7%; $P<0.05$).

Key words: rabbit, sperm quality, heat stress.

Introduction

The negative effects of high ambient temperatures on reproductive traits of rabbit bucks are well known, but there is a lack of analytic information in controlled conditions of chronic heat stress.

To improve the knowledge on this matter, a trial was projected with rabbit bucks exposed for a long time to high ambient temperatures.

Materials and methods

Ten N.Z.W. rabbit bucks, 7 months old and with body weight of kg 4.0 ± 0.2, were selected for homogeneous sperm output (ml 0.6 ± 0.1) from a group of thirty, after two months of training for semen collection with artificial vagina.

* Research supported by Ministry of University and Scientific and Technological Research.

Subjects were located into a climatic chamber for an initial adaptation period of three weeks. Ambient temperature was 20.3°C ± 1.1 (programmed 20°C) and relative humidity was 69.1% ± 3.5 (programmed 70%). The animals were then exposed for two months to a daily ambient temperature of 29.8°C ± 0.6 and relative humidity of 67.9% ± 1.7 (programmed 30°C and 70% respectively). The exposition time was of 21 hours a day with a relative remission for three hours to a milder ambient temperature of 24.7°C ± 0.8 and relative humidity of 72.5% ± 6.0 (programmed 25°C and 70% respectively). Light-dark period was 12/12 hours as suggested by Lebas et al.,1984.

Volume and concentration of semen were evaluated. Volume was measured three times a week in the two consecutive ejaculations constituting each collection. A graduated tube was utilized. Concentration was recorded, by a Buerker chamber, two times a week only on the first ejaculation.

For the statistical analysis of data a dependent Student t test was utilized.

Results and discussion

Total volume (fig.1) had a mean value of ml 1.10 ± 0.29 in the pre-stress period, and underwent a moderate increase (ml 1.23 ± 0.28) from 2nd to 9th week. The difference was not significant.

Volume of the first ejaculation is normally higher than the second one (Bonanno and Costanzo,1987; Panella and Castellini,1990). In this case any difference was observed in the pre-trial period and in the first week of treatment between first and second ejaculation of each semen collection. The difference appeared and became statistically significant (ml + 0.11, $P<0.05$) starting from the second week and it was due to an increase of the volume in the first ejaculation (from ml 0.56 ± 0.20 to ml 0.67 ± 0.21 in the pre-trial period and in the hot period respectively, +19.6%, $P<0.05$) since the volume of second ejaculation showed not significant variations.

The output of spermatozoa per ml ($x10^6$) (fig. 2) was 107.2 ± 50.9 in the pre-stress period. It showed a quick increase (185.5 ± 98.1; + 73.1%; $P<0.01$) in the first weeks of stress then it stabilized itself at one intermediate value (156.2 ± 91.5; + 45.7%; $P<0.05$).

Similar results were obtained by Battaglini and Costantini,1985, while many Authors, among them ourselves, observed a decrease of the volume and concentration during the hot season (Matheron and Martial,1981; Bonanno and Costanzo,1987; Morera et al.,1989; Panella and Castellini,1990; Lide et al.,1992).

The only important difference between the present trial and the ones reported in literature is that, in this case, the environment was completely controlled while in the field trials some uncontrolled factors (probably varying seasonal light time) could have had a major role. Bagliacca et al.,1987, observed a decrease in volume and concentration in controlled environmental condition (30°C) but light time was 15 hours per day like in summertime.

Total output of spermatozoa had a trend very similar to the one of concentration. In fact, comparing the results with the ones relative to volume, it must be concluded that, the total spermatozoa output is depending mainly on concentration ($r = 0.82$; $P<0.001$) then on volume ($r = 0.71$; $P<0.01$).

The high number of data: four ejaculations per eleven weeks per ten bucks, with a total of 1540 data for the three parameters (volume, concentration and total spermatozoa output) and the good correspondence between the measurements, indicate that, though the result is unexpected, at least some parameters can even improve during acute and chronic heat stress.

References

Bagliacca M., Camillo F., Paci G.(1987). Temperatura e performance di conigli maschi riproduttori. Riv. di Conigl. 10: 61-65.

Battaglini M., Costantini F.(1985). Caratteristiche dello sperma di coniglio in rapporto al ritmo riproduttivo e alla stagione. Atti 6° Congr. A.S.P.A., Perugia: 449-454.

Bonanno A., Costanzo D.(1987). Influenza di fattori fisiologici e climatici sul determinismo dei principali parametri riproduttivi di coniglie sottoposte ad inseminazione artificiale. Riv. di Conigl. 3: 33-39.

Lebas F., Coudert P., Rouvier R., De Rochambeau H.(1984). Le lapin. Elevage et pathologie. F.A.O., Rome, Italy.

Lide X., Guanfu Y., Zanmou C., Shaorong H., Jianru C., Shiyuan J., Youfu Y.(1992). Studies on integrative measures for raising the reproductivity ability of the domestic rabbit during hot seasons. J. Appl. Rabbit Res. 15: 569-574.

Morera P., Kuzminsky G., Finzi A.(1989). Fattori di variazione del volume dell'eiaculato nel coniglio all'inizio della carriera riproduttiva. 2° Meet. Naz. Studio della efficienza riproduttiva degli animali di interesse zootecnico, Bergamo: 109-113.

Panella F., Castellini C.(1990). Fattori ambientali e genetici che influiscono sulle caratteristiche del seme di coniglio. Riv. di Conigl. 8: 39-41.

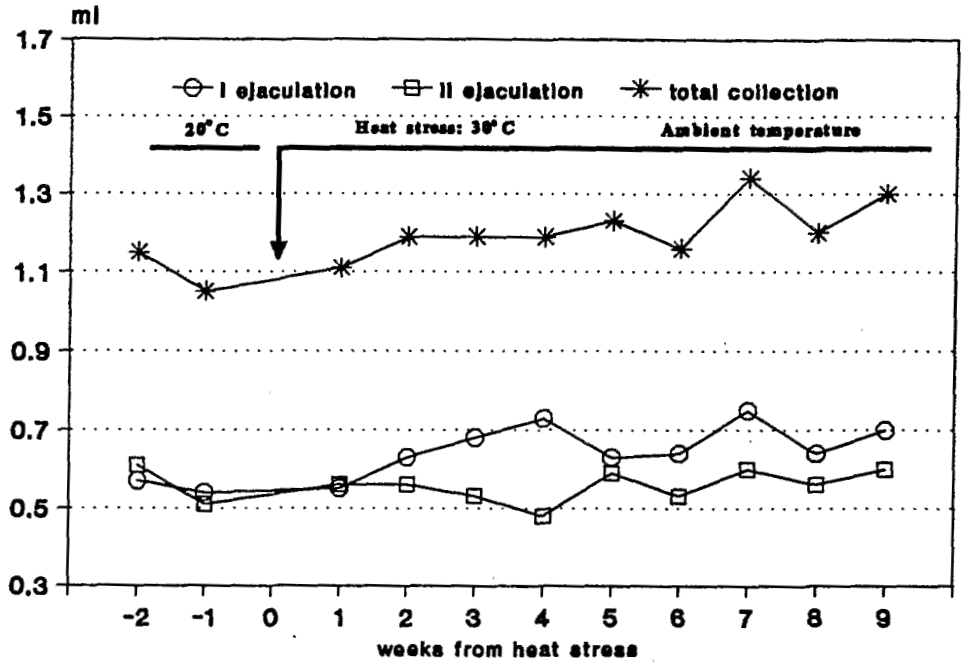

Fig.1.Volume of first and second ejaculation and total collection.

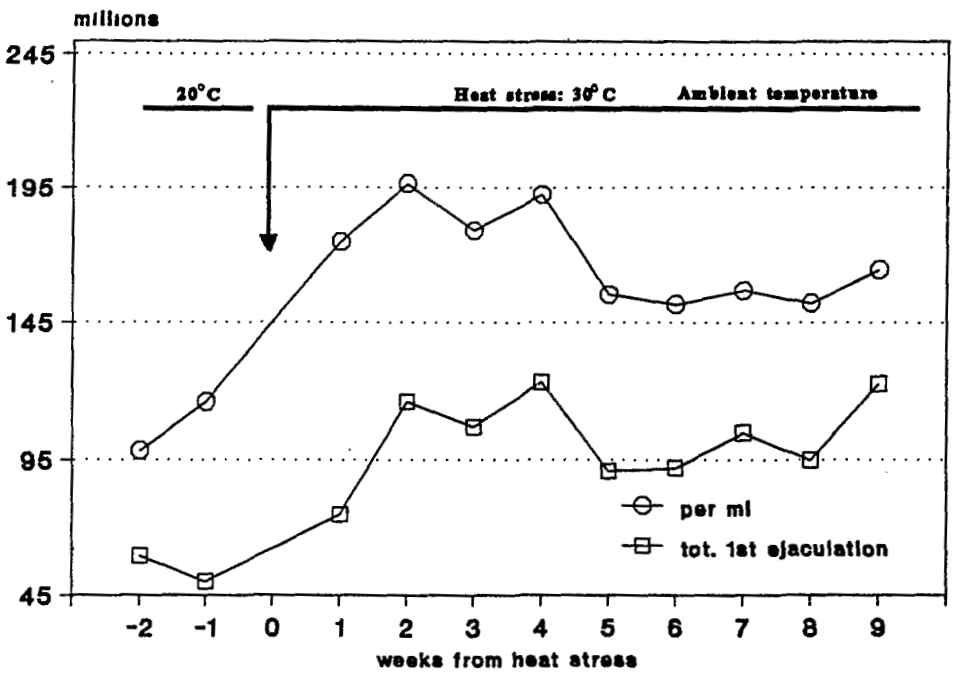

Fig.2.Spermatozoa output in the first ejaculation per ml and total.