Proceedings of the

4-7 July **2000** – Valencia Spain

These proceedings were printed as a special issue of WORLD RABBIT SCIENCE, the journal of the World Rabbit Science Association, Volume 8, supplement 1

ISSN reference of this on line version is 2308-1910
(ISSN for all the on-line versions of the proceedings of the successive World Rabbit Congresses)

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Volume A, pages 133-137

LITTER SIZE COMPONENTS FROM TWO SELECTED LINES OF RABBITS

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ABSTRACT

An evaluation of the performance reproductive before birth was carried out in different parities, seasons and lines in rabbits. A number of 132 laparoscopies were realised in order to know the ovulation rate, number of implanted embryos, number of live embryos, implantation rate, foetus survival**,** prenatal survival and total litter size at birth. The studied traits had similar values between second and third gestation. In relation to the season, the ovulation rate in summer was higher than in autumn but the litter size at birth was higher in autumn than in summer. Foetal losses were highest in summer.

INTRODUCTION

Litter size traits are important in rabbit meat production, consequently these traits have been objectives in selection programmes (Matheron and Rouvier, 1977; Estany *et al*., 1989). In general, these initial selection programmes have focussed on litter size at birth and weaning, recently Bolet *et al*. (1994) studied the relationships between components of litter size to apply in selection programmes.
Biological components of litter size are ovulation rate, fertilisation rate and prenatal survival, the latter component being defined by embryo and foetal survival. Prenatal survival seem the more important trait to define the litter size (Santacreu *et al*., 1992).
The aim of this study was to evaluate the effect of parity order and season on components of litter size from two lines selected for litter size at weaning.

MATERIAL AND METHODS

Animals

A total of 132 females from two lines were used in the experiment. Both lines, V and A, are currently selected for litter size at weaning. Line V is a synthetic maternal line selected since 1984 (Estany *et al*, 1989). Line A has been selected since 1980 (Baselga *et al* , 1984). All the does had their first mating at 18 weeks of age. For the successive gestations, they were mated 10 days after parity. Does were mated again every seven days if they did not become pregnant or they did not accept being mated the week before, which means that some of them will carry out gestation and lactation at the same time.
Laparoscopy was performed only on pregnant does in their second and third gestation, 12 days after mating. Some of these does were still lactating. The laparoscopy technique has been described by Santacreu *et al* (1990). Number of corpora lutea, live embryos and regressed embryos were recorded by laparoscopy.

Traits

The characters studied were: ovulation rate (**OR**) estimated as number of corpora lutea, number of implanted embryos (**ET**), number of live embryos (**LE**), total litter size at birth (**TB**), implantation rate estimated as **ET/OR**, foetus survival estimated as **TB/ET** and prenatal survival estimates as **TB/OR**.

Statistical analysis

Least square means for all traits were calculated on a model with effects:
- Type of doe: does of line A and V.
- Gestation order: second or third gestation.
- Season: summer, autumn and winter according to mating date.

Ovulation rate, number of implanted embryos and number of live embryos were included as covariate in the analysis of number of implanted embryos, number of live embryos and total litter size at birth, respectively.

RESULTS AND DISCUSSION

Line V shows 1.7 corpora lutea more than line A ($P<0.05$, table 1) and similar results for total and alive embryos implanted and litter size (table 1). In spite, no differences were found to prenatal survival (table 2). However, Vicente *et al.* (1995) observed differences in total litter size between preceding generation of both lines (11.4 vs 9.2, line V and line A, respectively). In other previous studies on the line V, Santacreu *et al*. (1992) observed similar values for the components of litter size (OR: 15.0, ET/OR: 86%, TB/OR: 67%).

Table 1.- Least square means and standard error of ovulation rate (OR), number of implanted embryos (ET), number of live embryos (LE) and total litter size at birth (TB) in different maternal lines.

Character	OR	ET	LE	TB
Line A	$13.2^{a} \pm 0.5$	12.0 ± 0.6	11.8 ± 0.6	9.7 ± 0.4
Line V	$14.9^{b} \pm 0.3$	13.2 ± 0.3	12.9 ± 0.3	9.9 ± 0.3

$^{a\,b}$ Least square means within a column and effect that do not share a common letter differ ($P<0.05$).

Table 2.- Implantation rate (ET/OR), foetal survival (TB/ET) and prenatal survival (TB/ET) in different type of does.

Character	ET/OR (%)	TB/ET (%)	TB/OR (%)
Line A	91 ± 3	78 ± 4	69 ± 4
Line V	87 ± 2	77 ± 2	68 ± 2

ET, number of implanted embryos; OR, ovulation rate; TB, number of litter size at birth.

The ovulation rate, total litter size at birth and foetal survival were different according with the season (tables 3 and 4). Although, ovulation rate was higher in summer than autumn while the litter size at birth was the lowest in summer (8.9 vs 10.3 and 10.2, autumn and winter, respectively, $P<0.05$, table 3). So, the highest prenatal losses (TB/ET) had placed in summer (71 vs 81 and 80, autumn and winter, respectively, $P<0.05$, table 4). In general, the high temperatures in the summer reduces receptivity and prolificity of does, this study indicated

that the pregnant does in summer from two lines had higher ovulation rate than in others seasons, probably due to the greatest requirements to develop as receptivity as gestation in this season. In addition, a temperature stress and a reduction of feed intake in summer affected negatively foetal survival rate (from implantation to delivery) and, consequently, decreased the number of total born.

Table 3.- Least square means and standard error of ovulation rate (OR), number of implanted embryos (ET), number of live embryos (LE) and total litter size at birth (TB) in different seasons.

Character	OR	ET	LE	TB
Summer	$14.9^{b} \pm 0.5$	12.6 ± 0.4	12.3 ± 0.1	$8.9^{a} \pm 0.4$
Autumn	$13.4^{a} \pm 0.3$	13.0 ± 0.3	12.6 ± 0.1	$10.3^{b} \pm 0.3$
Winter	$13.8^{ab} \pm 0.5$	12.8 ± 0.4	12.6 ± 0.1	$10.2^{b} \pm 0.5$

$^{a\,b}$ Least square means within a column and effect that do not share a common letter differ ($P<0.05$).

Table 4.- Implantation rate (ET/OR), foetal survival (TB/ET) and prenatal survival (TB/ET) in different seasons.

Character	ET/OR (%)	TB/ET (%)	TB/OR (%)
Summer	90 ± 3	71 ± 4^{a}	62 ± 4
Autumn	90 ± 2	81 ± 3^{b}	73 ± 3
Winter	88 ± 3	80 ± 4^{b}	71 ± 5

ET, number of implanted embryos; OR, ovulation rate; TB, number of litter size at birth.

Finally, the ovulation rate, the number of implanted embryos, the number of alive embryos, total litter size at birth and total and prenatal survival were similar in the second and third gestation (Table 5 and 6). Bolet *et al.* (1988) indicated that there were not significant differences between second and fourth gestation for ovulation rate and number of implanted sites. Recently, Lavara *et al*. (2000) observed differences in litter size between second and the rest parities with inseminated-crossbred females, the authors suggested a higher ovulation rate to primiparous lactating does. These differences can not justified on basis of results of this work on these selected lines. So, data from second and third gestation could be used to characterised the components of litter size.

Table 5.- Least square means and standard error of ovulation rate (OR), number of implanted embryos (ET), number of live embryos (LE) and total litter size at birth (TB) in different gestation.

Character	OR	ET	LE	TB
2nd gestation	13.9 ± 0.3	12.8 ± 0.2	12.6 ± 0.1	9.9 ± 0.3
3rd gestation	14.1 ± 0.4	12.8 ± 0.3	12.5 ± 0.1	9.4 ± 0.5

Table 6.- Implantation rate (ET/OR), foetal survival (TB/ET) and prenatal survival (TB/OR) in different gestations.

Character	ET/OR (%)	TB/ET (%)	TB/OR (%)
2nd gestation	88 ± 2	78 ± 2	68 ± 2
3rd gestation	90 ± 3	77 ± 3	69 ± 4

ET, number of implanted embryos; OR, ovulation rate; TB, number of litter size at birth.

ACKNOWLEDGEMENT

This work was supported by the C.I.C.YT. project AGF97- 0803.

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