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THE FERTILITY RATE OF ARTIFICIAL INSEMINATED RABBIT DOES: THE IMPACT OF SOME DOE RELATED FACTORS

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SUMMARY - The results of 1891 artificial inseminations (AI) in rabbit does, hold in 2 batches and using a 42 reproduction rhythm, were analysed. The effects of parity number, lactation and insemination order (1st or re-insemination) of does were studied. Nulliparous does had a fertility rate (FR) of 78.7%, indicating that a batch system could affect negatively the FR. The FR of lactating does was significantly (P<0.01) affected by the parity number. A quite linear increase of the FR was observed between primiparous does and does in their 4th and following lactations and amounted 57.2 (1st), 62.2, (2nd) 66.4 (3th) and 74.0% (4th and following), respectively. This improvement is explained by the increasing feed intake with parity number, which reduces the energy deficit during the lactation and consequently leads to a higher fertility rate. The average FR of lactating does inseminated 11 days post parturition was 69.4%. The non-pregnant does, re-inseminated 3 days after weaning, had a very favourable FR (80.6%). However, the following insemination of these does during the lactation, was not very fertile (only 48.9%). On the contrary, does which had at least 2 consecutive fertile inseminations showed a much higher FR (78.1%). It is concluded that a rest period does not have a positive impact on the success of the following insemination when performed during the subsequent lactation.

Key words: artificial insemination, rabbit, lactation, parity number, IA order.

RESUME - Analyse des facteurs influençant la fertilité chez la lapine en IA. *Au total, 1891 inséminations (IA) ont été effectuées dans une Station de Recherche. Les lapines étaient conduites en deux bandes dans un rythme de reproduction de 42 jours. L'objectif était d'analyser l'effet de la parité, de la lactation et de l'ordre de l'IA (1ère où ré-insémination). Les nullipares ont montré une fertilité de 78,7%, indiquant qu'un tel système de conduite en bande pourrait pénaliser leurs fertilité. La fertilité des femelles allaitantes a été significativement affectée par la parité (P<0,01). En effet, une augmentation linéaire a été observée entre les primipares et les femelles en 4ème (et plus) lactation et le taux de fertilité était de 57,2 (1ère); 62,2 (2ème); 66,4 (3ème) et 74,0%(≥ 4 lactations), respectivement. Cette constatation est expliquée par l'augmentation de la capacité d'iingestion au cours de la carrière de la lapine, qui se traduit par une réduction du déficit énergétique et par conséquence à un niveau de fertilité de plus en plus élevé. Le niveau moyen de la fertilité des femelles allaitantes, inséminées 11 jours* post partum, *était de 69,4%. Mais les femelles retours, ré-inséminées 3 jours après le sevrage, avaient montré une fertilité assez favorable (80,6%). Néanmoins, pendant la lactation suivante, ses mêmes femelles ont manifesté un faible taux de gestation (48,9%). Par contre, les femelles ayant au moins deux inséminations successivement fertiles, se sont distinguées par une meilleure fertilité (78,1%). Ce qui prouve qu'une large période de repos n'a pas d'impact positif sur la réussite de la prochaine IA, tout au long de la lactation.*

Mots-clès: *insémination artificielle, lapin, lactation, parité, ordre de l'IA.*

INTRODUCTION

Since the end of the eighties, artificial insemination (AI) has know increasing interest in commercial rabbit production. In Europe, AI is actually utilised to a large extend in Italy, France, Spain and Germany, especially when the production is organised in a batch system (Theau-Clément, 1998).

Many factors affect the reproductive performances of the female. The response depends mainly of the parity number, the physiological status and the sexual receptivity at the moment of insemination (Castellini, 1996). Differences are very marked, e.g. the number of weaned young/AI is very weak for lactating non-receptive does (0.9 - 2.7, depending of the reproduction rhythm) while an insemination of non-lactating receptive does resulted in 3.4 and 6.5 weaned young/AI, respectively (Theau-Clément, 1998). An optimalization of these factors is thus necessary to obtain high reproduction yields in a herd of AI rabbit does.

Also in our experimental rabbitry, different categories of does are present. In order to quantify the effects of parity, physiological status and insemination order, the overall results of a 10 month experimental unit were analysed.

MATERIAL AND METHODS

Does and reproduction system.

Between April 1997 and February 1998, 1891 inseminations were performed on 160 does. These does were hold in 2 production groups (batches) using a 42 days reproduction rhythm. Each 3 weeks, one batch was inseminated together with the non-pregnant does of the other batch. Because weaning was performed 29 days after parturition, non-pregnant does were re-inseminated 3 days after weaning. Does belonged to the Institutes' strain (Maertens, 1991). The initially herd consisted of nulliparous and multiparous does. Does were replaced by nulliparous does in case of infertility (2 x consecutively non-pregnant), improductivity or mortality.

Artificial insemination

IMV equipment was used for semen collection, the preparation of straws and for the insemination (lordosis position). Approximately 50 millions of heterospermic sperm cells were inseminated. At the moment of insemination, vulva colour was judged. Does with small pale vulva were considered as not receptive while a coloured (red) and/or swollen vulva was considered as an indication of receptivity. Several methods to synchronise the oestrus were examined during this period. These results will be presented elsewhere.

Statistical treatment

Data were analysed by a three-factorial analysis of variance (ANOVA, SPSS, version 7.5). The model included the factors receptivity, lactation, parity number and their interactions. Means were compared using Fishers LSD test.

RESULTS AND DISCUSION

Physiological status of the doe

In Figure 1 distinction is made between inseminations of nulliparous, lactating and re-inseminated does. Both receptivity as fertility were significantly higher when does were re-inseminated. The negative interaction of the lactation on reproductive traits of does has been demonstrated in numerous reports (see reviews Fortun-Lamothe and Bolet, 1995; Castellini, 1996; Theau-Clément, 1998). However, a surprisingly high fertility rate (FR) was obtained in re-inseminated does (80.6%). In other species (goats, cows, sows), the 2nd insemination is considered as less successful because only the less fertile females have to be re-inseminated. The following explanations can be given for the favourable FR (i) the antagonism between lactation and the reproductive function does not more exist and (ii) the weaning effect has a synchronising effect on the onset of the oestrus (Diaz et al., 1989; Theau-Clément and Roustan, 1992; Szendrö et al., 1992; Fortun et al., 1993). As shown in Figure 1, nearly 90% of our does showed oestrus signs 3 days after weaning.

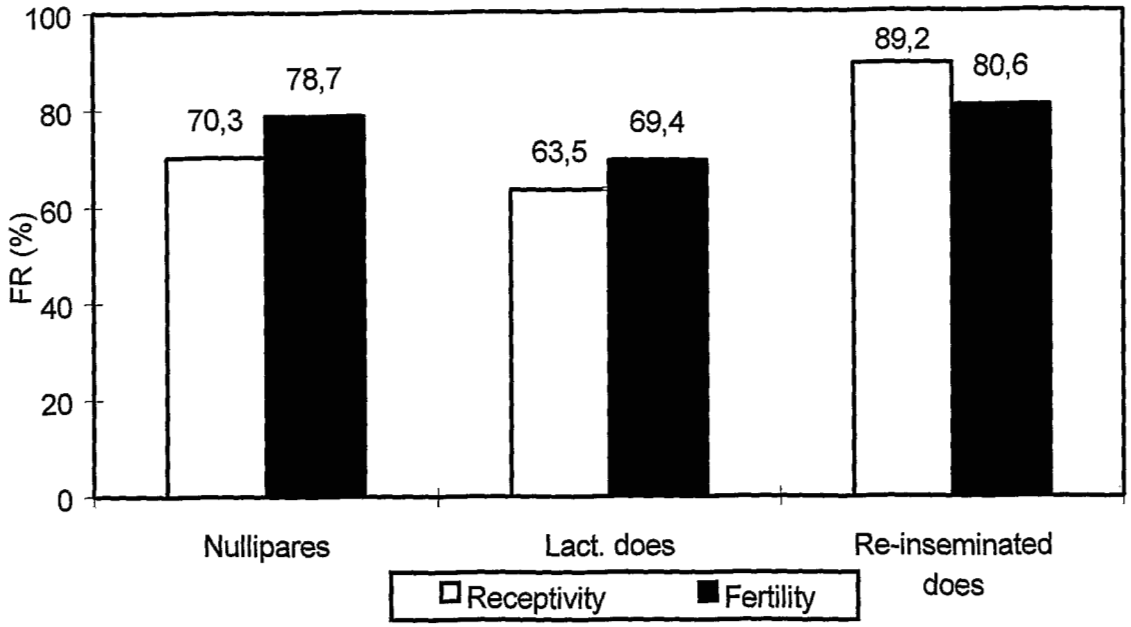

Fig. 1. Receptivity and fertility rate according to physiological status.

Also interesting is to note that the vulva coloration underestimates the FR of lactating and nulliparous does (6.0 and 8.5 points, respectively) while after weaning an opposite effect was found (Figure 1). This could indicate that, as in other species, "silent" oestrus occurs in some categories of does.

The FR of nulliparous does was 78.7%. However, this category of does is considered as very fertile and FR of 85 - 90% are not an exception (Maertens & Okerman, 1987). An explanation for the moderate FR has to be searched in the preparation of this females. When using a batch system, with AI intervals of 3 weeks, young does are not always inseminated at optimal age (4 months) and body condition. In fact a number of does where quite aged (17 - 19 weeks) and tended to be too fat or when restricted not always a consequent flushing was performed. Special attention has to to be drawn to nulliparous does when using a batch sytem.

Parity number of lactating does

Parity number had a significant ($P<0.01$) effect on FR of lactating does (Figure 2). Primiparous does showed a low FR (57.2%) in agreement with Bourdillon et al. (1992) and Poudjardieu & Theau-Clément (1995). However, also during the 2nd and 3rd lactation a significant ($P<0.05$) decreased FR rate was obtained compared with does in parity 5. In fact, quite a linear increase (with 5 points between parities) of the FR was observed from parity 1 to 5. But because differences between the 4th and 11th parity were not significant, a mean FR of 74.0 was obtained for these AI. The effect of parity was less pronounced in the study of Poudjardieu & Theau-Clément (1995). However, the effect of parity was expressed as % of does which had two successive lactations and not as a fertility rate. Interesting was the observation that a significant interaction exists between the genetic strain and parity.

The relationship between parity number and FR has to be searched in the nutritional status of the does during the lactation. Because of an immature intake capacity during early reproduction life, does are in a very negative energy balance (for a review see Xiccato, 1996).

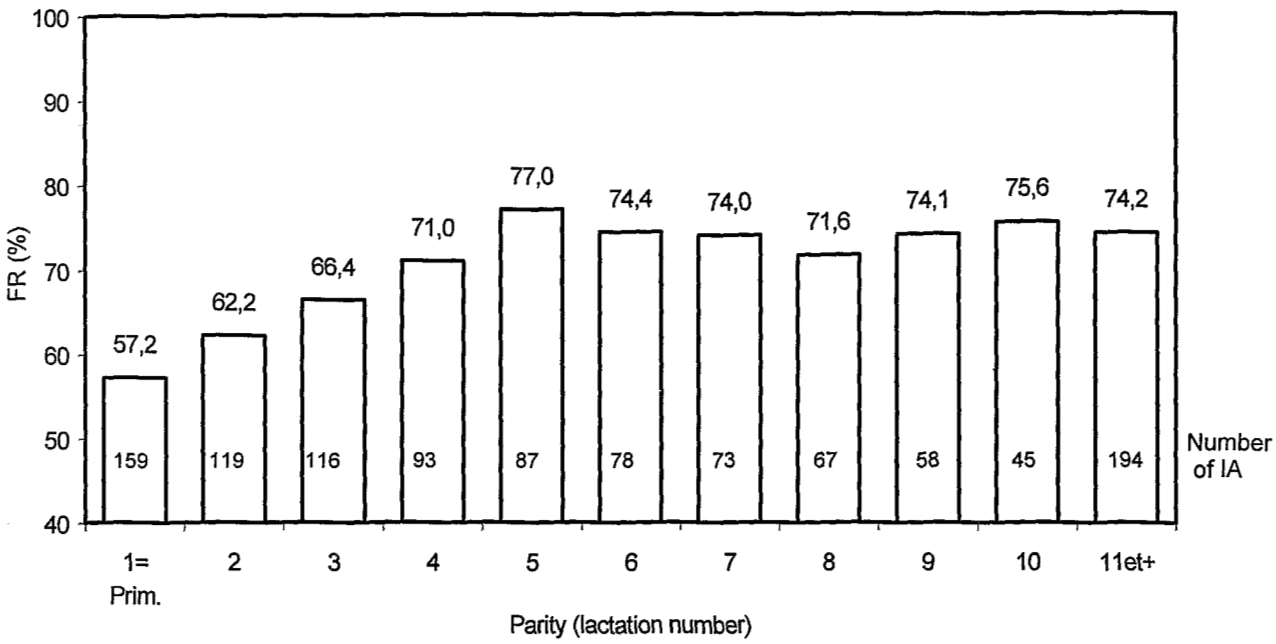

Fig. 2. Fertility rate of lactating does according to parity number

First insemination vs re-insemination

As shown in Figure 1, re-inseminated does showed a good FR when AI was performed 3 days after weaning. However, when we analysed the FR of these does during their next lactation, a remarkable low FR was found (Figure 3). Only 48.9% of these does were pregnant while a FR of 78.1% was found in does which had at least 3 consecutive fertile inseminations. In fact, non-pregnant does had a rest period of 34 days between 2 lactations. But this had not a positive effect on their fertility during their next lactation.

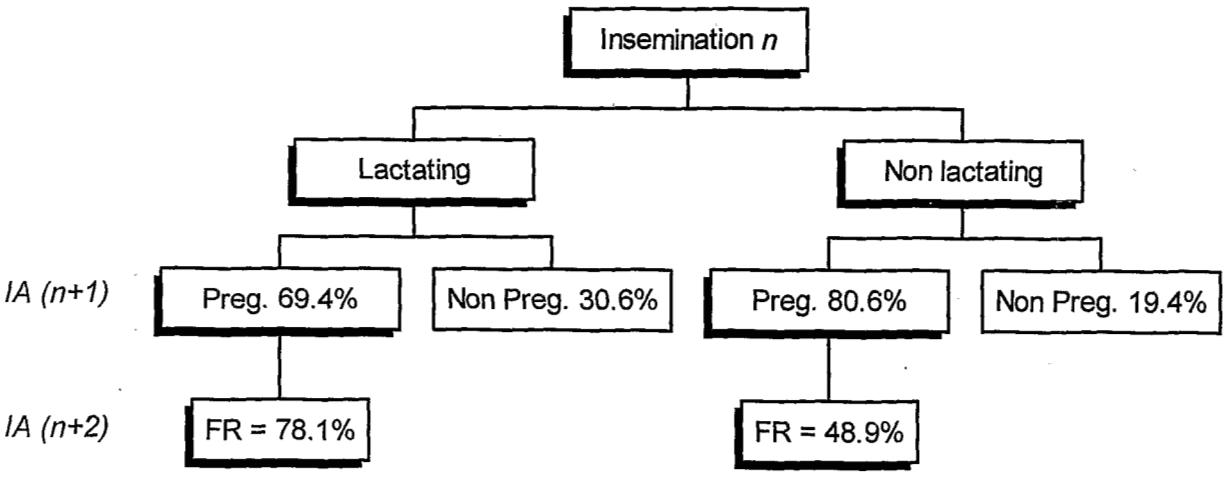

Fig. 3. Results of succesive AI in lactating and non-lactating does

An explanation for this large distinction has to be searched in the selection of does, data and in the reproduction rhythm followed in our experimental herd. Does which have to be re-inseminated belongs to the less fertile category. Because of the oestrus synchronisation 3 days after weaning, they obtain good FR when re-inseminated and their low fertility is masked. However, when inseminated under less favourable conditions (during their next lactation) they expose their low reproduction capacities. On the other hand, a resting period between 2 lactations does not seem to have a positive effect on the further reproduction career.

It would be of interest to determine if there exist a relationship between the intake and/or energy balance, during the lactation, between "fertile" and less fertile does. Finally it could also be hypothesised that probably does having the strongest hormonal antagonism between lactation and reproductive functions have mainly to be re-inseminated. Indications of a depressing effect of prolactin on gonadotrophin secretion have been mentioned (Fortun-Lamothe and Bolet, 1995).

CONCLUSIONS

When using AI in rabbits, following a 42 days reproduction rhythm, a favourable FR of re-inseminated does could be obtained when the AI is performed 3 days after weaning. However, attention has to be drawn on the fact that this method mask the low fertility of these does because during the following lactation their FR was less than 50%.

The parity number has an important impact on the FR. A linear increase of 5 points in FR per parity was obtained between primiparous does and does in their 4th reproduction cycle.

Finally, our analysis indicates that the FR of nulliparous does could be less favourable when using a batch system with 3-weeks intervals between insemination groups. Special attention has to be drawn to the preparation of young does.

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