

## GROUPING OF RABBIT REPRODUCTION MANAGEMENT BY MEANS OF ARTIFICIAL INSEMINATION

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**SUMMARY :** One hundred and thirty does of the Californian x New Zealand breed were artificially inseminated on a fixed day of the week, during a thirteen months long study. All insemination were performed on Monday, using 1 ml diluted semen. Does with less than 8 young/litter (M1) were inseminated on day 3 or 4 post-partum (PP.), and rabbits with than 8 or more young/litter (M2) on day 10 or 11 PP. All does found non pregnant were considered pseudopregnant and inseminated on day 24 PP. (M3). The first artificial insemination (A.I.) in nulliparous rabbits was performed at 4 months of age. 1679 A.I. were carried out during this experiment. Ovulation was induced with 20 µg of GnRH (Fertagyl, Intervet Lab.) in all rabbits, without considering their sexual receptivity. The overall conception rate (C.R.) obtained was 58.5 %. The lactation significantly influenced conception rate in animals inseminated in the post-partum period (P<0.001). Higher conception rate was observed in does inseminated after a first non-fertile insemination (type M3), (P<0.05). No difference between does M1 vs M2 was detected. C.R. in nulliparous does was higher compared to rabbits M2, and lower than rabbits M3 (P<0.05). Although rabbits were inseminated on a fixed day of the week, as a consequence of the pregnancy period variations, A.I. was

finally performed between day 1 to 12 PP. Nevertheless, most of the inseminations were carried out on days 3, 4 and 10, 11 PP. Lower C.R. were obtained when comparing A.I. on days 3 to 5 and 9 to 12 PP., versus females inseminated on days 1 to 2 and 6 to 8 PP. (50.3 % and 48.9 % vs 69.5 % and 66.6 % respectively), (P<0.001). A significant interaction type of rabbit lactation was detected when comparing non lactating rabbits inseminated on days 3 or 4, 10 or 11, 24 or after PP., versus lactating does inseminated on the same days (71.78 %, 68.9 %, 71.5 % vs 53.6 %, 48.7 %, 62.2 %, respectively, P<0.001). No influence on prolificacy was detected. The overall means obtained were : No. of young born/litter : 7.1 ± 0.1 ; No of young born dead/litter : 0.6 ± 0.05.

Our results suggest a better reproductive management when A.I. was performed on one fixed day of the week. Practically all pregnancy diagnosis by abdominal palpation were carried out on Fridays (day 11 after A.I.), nest settings on Tuesdays (day 29 after A.I.), and parturition occurred on Thursdays and Fridays (day 31-32 after A.I.) of the same week. Nevertheless, the better C.R. observed in does A.I. on days 1 or 2 and 6 to 8 suggests that reproductive management could be organized on two fixed day of the week.

### **RESUME :** Organisation de la reproduction groupée chez le lapin grâce à l'insemination artificielle.

Cent trente lapines Californiennes x Neo Zélandaises ont été artificiellement inséminées, un jour fixe de la semaine, durant une période d'étude de treize mois. Toutes les inséminations ont été pratiquées le Lundi, en utilisant 1 ml de semence diluée. Les lapines ayant moins de 8 lapereaux par portée (M1) ont été inséminées le 3 ou 4ème jour post partum (PP) et celles avec 8 lapereaux ou plus par portée (M2) le 10 ou 11ème jour PP. Toutes les lapines reconnues non gestantes ont été considérées comme pseudo gestantes et inséminées le 24ème jour PP (M3). La première insémination des lapines nullipares a été pratiquée à l'âge de 4 mois. 1679 inséminations artificielles ont été pratiquées pendant cette expérimentation. L'ovulation était induite par 20µg de GnRH (Fertagyl, Intervet Lab.) pour toutes les lapines, sans tenir compte de leur réceptivité sexuelle. Le taux de fécondation globale a atteint 58.5 %. Le taux de fécondation était significativement influencé par la lactation pour les lapines inséminées PP (P<0.001).

Le taux de fécondation le plus élevé a été observé chez les lapines inséminées après une première insémination non fertile (type M3), (P<0.05). Entre les lapines M1 et M2 aucune différence n'a été détectée. Le taux de fécondation chez les lapines nullipares était supérieur comparé aux lapines M2 et inférieur comparé aux lapines M3 (P<0.05). A cause de la variation de la durée de gestation, et bien que les

lapines aient été inséminées à jour fixe dans la semaine, l'insémination artificielle a finalement été pratiquée entre le 1er et le 12ème jour PP.. Néanmoins, la majorité des inséminations ont été pratiquées 3, 4 et 10,11 jours PP.. Le taux de fécondation le plus bas concerne les inséminations 3 à 5 et 9 à 12 jours PP. comparés aux inséminations 1 à 2 et 6 à 8 jours PP. (50.53 % et 48.9 % vs 69.5 % et 66.6 % respectivement) (P<0.001). On remarque un interaction significative lapine/lactation lorsqu'on compare les lapines non allaitantes inséminées le 3, 4 et 10ème jour ou les 11, 24ème jour et plus PP. et les lapines allaitantes inséminées les mêmes jours (71.7 %, 68.9 %, 71.5 % et 53.6 %, 48.7 %, 62.2 %, respectivement, P<0.001). Pas de différence de prolificité n'a été détectée. Les moyennes générales obtenues étaient : Nb de lapereaux nés / portée : 7.1 ± 0.1 ; Nb de lapereaux morts / portée : 0.6 ± 0.05.

Nos résultats suggèrent une meilleur organisation de la reproduction lorsque l'insémination artificielle est pratiquée à jour fixe dans la semaine. Pratiquement tous les diagnostics de gestation par palpation abdominale sont pratiqués le Vendredi (11 jours après I.A. Les nids se font le Mardi (29 jours après I.A.) et les mises bas surviennent le Jeudi ou le Vendredi (31 ou 32 jours après I.A.) de la même semaine. Néanmoins, le meilleur taux de fécondation étant observé chez les lapines inséminées le 1er ou 2ème et les 6ème ou 8ème jours, l'organisation de la reproduction peut être envisagée sur deux jours fixes de la semaine.

## INTRODUCTION

Since the 1970's, the use of artificial insemination (A.I.) in rabbit farms has been evaluated as an alternative to natural breeding (PAUFLER *et al.*, 1979 ; BATTAGLINI *et al.*, 1986 ; THEAU-CLÉMENT and ROUSTAN, 1992). Results differ greatly among authors, farms and time of the year, and scanty information is available to explain such differences. A decrease in the conception rate (C.R.) and prolificacy is obtained after A.I., compared with results observed when using natural breeding (BLOCHER and FRANCHET, 1990). Moreover, A.I. in rabbits is a technique which could be employed in order to group reproductive management on a fixed day, optimizing the specialized hand work and compensating in this manner the C.R. decrease.

This experiment was designed to study the influence of the lactation and parturition-insemination interval, when A.I. is performed on a fixed day of the week.

## MATERIAL AND METHODS

130 does of the California x New Zealand breed were artificially inseminated on a fixed day of the week, during a thirteen month long experiment. All inseminations were performed on Monday.

Does with less than 8 young/litter were artificially inseminated on day 3 or 4 post-partum (PP.) and rabbits with 8 young/litter or more on day 10 or 11 PP.

Although rabbits were inseminated on a fixed day of the week, as a consequence of variations in the pregnancy period, A.I. was finally performed between day 1 and 12 PP. Most of the inseminations were carried out on days 3, 4 and 10, 11 PP. Furthermore, some animals experienced abortion on the 28th day of pregnancy and next insemination was performed 7 days later and considered as post partum insemination on day 7th. The insemination distribution is shown on Table 1.

All does found non pregnant were considered pseudopregnant and inseminated on day 21 after a previous non fertile A.I. The first A.I. in nulliparous rabbits was performed at 4 months of age.

1679 A.I. were carried out during this experiment. Ovulation was induced with 20 µg of GnRH (Fertagyl, Intervet Lab.) in all rabbits, without considering their sexual receptivity. Semen was collected using an artificial vagina. Volume, colour, density, mass motility, individual motility and sperm concentration, were checked in every ejaculation. A pool of semen was made after quality checking and each doe was inseminated using 1 ml diluted semen containing approximately 20 million spermatozoa. Dilutions were made using skim milk + 500 IU penicillin procain + 500 IU penicillin benzatine + 0.01 streptomycin sulphate/1ml diluted semen. Cristal sterilized catheters (110 degrees Celsius during 30 minutes) were used.

The influence of type of rabbit and lactation on the conception rate, number of young born/litter, and number of born dead/litter, were studied after parturition. Animals were classified as the following types :

- 1) nulliparous (NULL)
- 2) multiparous with less than 8 young/litter and 1 or more parturitions (M1). These females were artificially inseminated on day 3 or 4 PP.
- 3) multiparous with 8 young/litter or more and 1 or more parturitions (M2). These animals were inseminated on day 10 or 11 PP.
- 4) multiparous does with 1 or more parturitions (M3), A.I. on day 21 after a previous non fertile insemination
- 5) lactating or non lactating does

The influence of these factors on the above mentioned parameters were statistically analyzed as follows : the C.R., which did not follow the normal distribution was determined using the non parametric test CATMOD (Categorical data modeling). Means were compared using a Contrast test. The influence on the number of young born/litter, and the number of young born dead/litter were analyzed by means of the GLM test (General Lineal model), and their means were compared using the WALLER and DUNCAN test (SAS, 1985).

## RESULTS

### Conception rate

C.R. found are presented in tables 2, 3 and 4. The overall C.R. obtained was 58.5 %. Higher mean

**Table 1 : Number of artificial insemination (A.I.) performed in relation to the post partum day (p.p.d.)**

p.p.d.	1	2	3	4	5	6	7	8	9	10	11	12
No A.I.	39	56	145	106	69	30	22	23	29	93	184	39

**Table 2 : Conception rate (C.R.) obtained by A.I. in nulliparous, multiparous with less than 8 young/litter on days 3 or 4 PP. (M1), multiparous with 8 young/litter or more on days 10 or 11 PP. (M2) and on day 24 PP. or later (M3).**

Type of doe	No. A.I. performed	C.R. %
Nulliparous	297	58.2a
M1	467	55.9ab
M2	368	50.3b
M3	547	66.5c

C.R. followed by different superscripts are significantly different (P<0.05)

C.R. was observed in does A.I. after a previous non fertile insemination (type M3) (P<0.05). No differences between does M1 vs M2 was detected. C.R. in nulliparous does were higher compared to rabbits M2, and lower than in rabbits M3 (P<0.05) (Table 2).

A significant interaction type of rabbit\*lactation was detected when comparing non lactating rabbits artificially inseminated on days 3 or 4, 10 or 11, 24 or after 24 PP., versus lactating does inseminated on the same days (Table 3 ; P<0.001)

Lower C.R. were obtained when comparing does inseminated on days 3 to 5 and 9 to 12 PP., versus females inseminated on days 1 to 2 and 6 to 8 PP. (Table 4, P<0.001).

**Table 3 : Conception rate (C.R.) obtained by A.I. in multiparous with less than 8 young/litter on days 3 or 4 PP. lactating does (M1L+) and non lactating (M1L-) ; multiparous with 8 young/litter or more on days 10 or 11 PP. lactating does (M2L+) and non lactating (M2L-) ; nulliparous on day 24 PP. or later lactation does (M3L+) and non lactating (M3L-).**

Type of doe	No. A.I. performed	C.R. %
M1L+	407	53.6a
M1L-	60	71.7b
M2L+	339	48.7a
M2L-	29	68.9b
M3L+	294	62.2c
M3L-	253	71.5b
Lactating		
M1 + M2 + M3	1040	54.4a
Non lactating		
M1 + M2 + M3	312	71.3b

C.R. followed by different superscripts are significantly different (P<0.001).

**Table 4 : Conception rate (C.R.) in A.I. at different intervals after parturition.**

Parturition - A.I interval (days)	C.R. %
1 - 2	69.5 b
3 - 5	50.3 a
6 - 8	66.6 b
9 - 12	48.9 a

Means followed by different superscripts are significantly different (P<0.001).

### Prolificacy

Prolificacy results are presented in Table 5. The overall means obtained were :

No. of young born/litter :  $7.1 \pm 0.1$

No of young born dead/litter:  $0.6 \pm 0.05$

No influence on these parameters was detected.

## DISCUSSION

### Conception rate

The overall C.R. obtained is in accordance with several authors (ZANIRATO, 1989; ROUSTAN and

**Table 5 : Litter size at birth and number of born dead/litter obtained by A.I. in nulliparous, multiparous with less than 8 young/litter on days 3 or 4 PP. (M1), multiparous with more than 8 young/litter on days 10 or 11 PP. (M2), multiparous on day 24 PP. or later (M3) and in lactating or non lactating does.**

Type of doe	No. of parturitions	Litter size at birth	No. of born dead/litter
Nulliparous	155	$6.6 \pm 0.2$	$0.4 \pm 0.1$
M1	235	$6.7 \pm 0.2$	$0.8 \pm 0.1$
M2	169	$7.3 \pm 0.2$	$0.7 \pm 0.1$
M3	346	$7.0 \pm 0.2$	$0.6 \pm 0.1$
Lactating			
M1+M2+M3	518	$7.0 \pm 0.1$	$0.5 \pm 0.1$
Non lactating			
Null+M1			
+M2+M3	387	$6.9 \pm 0.1$	$0.8 \pm 0.1$

MAILLOT, 1990 ; BONANNO *et al.*, 1993). The lowest C.R. was detected in M1 and M2 rabbits. Similar results were obtained by FREYCHAT *et al.* (1989) in females artificially inseminated before day 7 PP. This result could be related to the high plasma prolactin levels described in the first two weeks of the lactation period (UBILLA *et al.*, 1992), and to the inhibitory effect of hyperprolactinemia on ovulation response (MORIOKA *et al.*, 1990). Our results are also in agreement with those obtained by BLOCHER and FRANCHET (1990) and ROUSTAN and MAILLOT (1990) who observed a 37.4 % to 48.3 % C.R. in does inseminated on days 2-4 after parturition, without using any stimulation on follicle growth.

Does inseminated on days 1 or 2 PP. showed higher C.R. (Table 4), coinciding with other studies in which increased C.R. are related to high sexual receptivity and plasma estradiol concentrations (PAUFLER *et al.*, 1979 ; BLOCHER et FLANCHET, 1990 ; MAERTENS and OKERMAN, 1987 ; LANGE and SCHLOLAUT, 1988 ; SCHLOLAUT, 1989). Nevertheless, several variations were also observed on days 3 to 5, 6 to 8 and 9 to 12 PP. Similar results during the lactation period were obtained by ZANIRATO (1989), RODRIGUEZ DE LARA (1989) and ROCA and FANLO (1983). Our study suggests that better C.R. are obtained in does inseminated on day 1, 2 and 6 to 8 PP. when animals reached the maximal sexual receptivity, and when many preovulatory follicles with high steroidegenic activity are present (MAERTENS and OKERMAN, 1987 ; CASTROVILLI *et al.*, 1986). The high plasma estradiol levels described during these two PP. intervals could also explain our results (UBILLA and REBOLLAR, 1994). The better C.R. observed in A.I. on days 1 or 2 and 6 to 8 suggest that the reproductive management could be organized two fixed days of the week.

C.R. in M1 and M2 does are probably influenced by lactation, moreover, M3 rabbits showed similar results when compared to non lactating animals (Table 3). M3 rabbits are inseminated on the latest lactation period, when milk production and prolactin inhibitory effects on the ovulation response is very low (FUCHS *et al.*, 1984 ; YOSHIMURA *et al.*, 1990). Our results obtained in this type of rabbit (M3) are in agreement with those obtained by ZANIRATO (1989).

### Prolificacy

A trend was observed towards an increase in prolificacy related to the number of parturitions (Table 5), although no influence of type of rabbit on prolificacy was detected.

The use of sterilized insemination catheters, as well as the addition of an antibiotic to the semen probably decreased embryo mortality and improved

prolificacy in our rabbits. According to MERCIER and RIDEAUD (1992), there is no clear relation between the bacteriological and biological quality of semen, but GRILLI *et al.* (1992) suggest the use of an antibiotic in semen to resist the pathogenic potential of different bacteria isolated from sperm samples (*Escherichia coli*, *Stafilococcus Aureus*, *Clostridium Perfringes*) which present some negative correlations with prolificacy.

In accordance with CRIMELLA *et al.* (1992) although no significative differences in the prolificacy exist, when comparing the A.I. performed using single diluted ejaculate, or using a semen pool, better C.R. and prolificacy rates are obtained in does inseminated using pool semen. These findings could explain the results of this part of our experiment.

Better reproductive management resulted when A.I. was performed one fixed day of the week. Almost all pregnancy diagnosis by abdominal palpation were carried out on Friday (day 11 after A.I.), nest settings on Tuesdays (day 29 after A.I.) and parturition occurred on Thursdays and Fridays (day 31-32 after A.I.) of the same week. The better C.R. observed in A.I. on days 1 or 2 and 6 to 8 suggests that reproductive management could be organized two fixed days of the week. As this reproductive management complicates the work organisation and increases the costs, so further studies are necessary to adapt the A.I. technique to possible reproductive rhythms (4 and 11 PP.) based on one fixed day of the week.

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