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INVESTIGATIONS ON THE RESULTS OF ARTIFICIAL INSEMINATION

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Introduction

Considerable research has been conducted on the artificial insemination (AI) in rabbits. Comparison of hormones and hormone-like materials, determination of most favourable doses and dilutions, etc., have been important steps to elaborate for AI technologies.
Facchin et al. (1988) observed large different in conception rate (CR) of does under similar condition using AI (between 44.6 and 86.2 %). The results of AI depend on several factors. According to literature data, the most important factors are the color of vulva, season, age of does and time of re-breeding. Since the virgin does show excellent CR and significant differences were found between the suckling does and weaned ones (Szendrő and Bíró-Németh, 1991), in this study the does were divided into 3 groups: nullipara, suckling and weaned ones.

Materials and Methods

The experiment was carried out at the research rabbit farm of the Pannon University of Agric.Sci., Kaposvár. The analysis was performed on a New Zealand White stock (644 inseminations). The does were housed in closed rabbit house in flat-deck wire cages. In summer, temperatures can rise above 25 ^{o}C; in winter time they are about 12-16 ^{o}C. Artificial light was provided during working time (about 7-8 hours per day); otherwise light from the windows was utilized. The rabbits were fed ad libitum a commercial pellet and hay. The water was provided all time by automatic watering system.
The semen was collected by artificial vagina. Only those with good or excellent characteristics were diluted about 1:10. GnRH analogous (0.5 ml Ovurellin, Reanal^{R}) was injected into the muscle of does at the time of

insemination using fresh semen. The pregnanacy was determined by palpation 10-14 days after insemination. That was diagnosed non-pregnant were inseminated again some days later.
Observations were made on the effect of season, month of insemination, body weight of does at previous kindling, number of suckling rabbits at 21 days.

Results and Discussion

Reproductive status of doe

The CR of virgin does was excellent, above 90 %. A 10-15 % difference was noted between the CR of does inseminated before and after weaning (66.1-67.1 v.s. 77.0-83.8 %). The LS were similar in the group of virgin does and suckling ones (8.06-8.15 and 8.10-8.22 resp.), while the weaned does achieved only 7.26-7.64. Sinkovics (1982), Battaglini et al. (1986), Machisi et al. (1988) and Zanirato et al. (1988) reported good results of CR for nullipara does as well. It seems the milk production has a negative effect on CR, but the LS is higher in this group than of weaned does. In the latter group most of the does were non-pregnant after first insemination (during suckling) so in spite of the good CR the ova shed were fewer or the embryonic mortality was higher.

Time of re-breeding (Table 1)

The CR were low during the first 15 days after kindling (19 %) but it was good between 16-40 days (72.3 %) and the best results were achieved after weaning (83.8 %). Similar tendency was published by Sinkovics (1982), Zanirato et al. (1988), Zanirato (1989) and Freychat et al. (1989). Paufler et al. (1979) demonstrated conflicting results, does were inseminated on day 1, 2, 3 and 4 after parturition and the highest CR (77.8 %) and LS were achieved by insemination on day 2. It should be important to carry out some experiment to examine the effect of post-partum insemination in different environmental conditions. Our data show that CR and LS of does inseminated after 60 days are low. The reason for this are that some of the does either did not show estrus or were barren.

Age of doe (Table 2)

There is a close correlation between the age of does and CR and LS. With the increasing age decreased the CR and LS. But there were difference among the 3 groups. All of the virgin does were young with excellent CR.

While at the age of 6-9 months the CR were similar in the group of suckling does and weaned ones a definite difference could be found between the two groups, the CR decreased mostly for the cuckling does (from about 70 % to 40 %). Lange and Schlolaut (1988) reported the highest CR for the 4th parity of does inseminated immediately after kindling.
LS showed change similar to those observed for natural mating (Matheron and Rouvier, 1978; Varga and Szendrő, 1984). In the groups of suckling and weaned does an increase was detected until the age of 8-13 months (8.71 and 8.88 resp.), after that there was a decrease mostly for the does inseminated after weaning. Hulot and Matheron (1981) noted that ovulation site were fewer for nullipara does and pre- and post-implantation rates of mortality were low too. The number of corpora lutea increased in the multipara group, and the embrionic losses were higher. This may also be true for AI.

Season (Table 2)
The highest CR could be achieved in April and May (92.5 %) and the lowest ones in August and September (60.1 %). The seasonal fluctuation was lower for the does inseminated after weaning. For the suckling does the difference between the highest (93.6 %) and the lowest CR (49.1 %) amounted to 44.5 %.
The largest LS (8.60 and 8.53) were obtained in spring (February-May) and the lowest (7.32 and 7.26) in summer time (June-September). The highest seasonal change was in the group of weaned does.
The number of virgin does were small to examine the effect of season.
In agreement with practical observations and research results of Hulot and Matheron (1981) and Csonka and Szendrő (1984), it appeared that season affected natural matings and AI (Sinkovics and Haut, 1988; Valentini et a., 1988), although according to Sinkovics and Haut (1988), seasonal fluctuation was lower for AI than for natural matings. It should be noted that Schlolaut et al. (1981) obtained good results with AI on summer and fall if inseminations were done immediately after kindling. In this case very good environmental and feeding conditions were needed. It is assumed that the low number of does in heat at the end of summer and begining of fall is the cause of low CR. Various authors heve stated that for natural matings (Delaveau, 1978; Pla et al., 1984; McNitt et al., 1989) and AI (Maertens et al., 1983; Pizzi et al., 1984; Battaglini et al., 1985), the color of the vulva plays an important role in mating ability of does,

ovulation and other reproductive traits. The results of Schlolaut et al. (1981) were achieved because a number of the does were in heat after kindling.

The high temperatures have a negative effect on embryonic mortality. Probably this is the reason why in summer the LS are lower than other part of the year.

Body weight of doe (Table 3)

The body weight of does at the previous kindling did not influence on the CR (66.7-20.2 %) until 4.5 kg but above 4.5 kg body weight the CR was higher with about 15-20 %. No definite trend was detected on CR for the weight of weaned does but in the group of suckling ones CR differed significantly between dams under and above 4.5 kg (63.7 v.s. 85.7 %).

The effect of body weight of doe on LS was not significant in groups of suckling and weaned dams.

Earlier, opposite results were obtained for natural matings (Szendrő et al., 1989); LS was highest (8.98) for does with 4.0-4.4 kg live weight and lowest for those under 3.6 kg and above 4.8 kg (8.17 and 7.25 resp.). Analysis of the date showed that lower body weights were not the only cause of lower LS, but that body condition was also a factor. Vrillon et al. (1979), using AI, reported 4-10 % difference between does with body weight under and above 3.4-3.5 kg.

It seems that does with larger body weight have advantage in case they produce milk at the time of insemination. It is probably that these does have more chance to conceive during lactation.

Number of suckling animals at the time of insemination (Table 4)

CR and LS were not influenced by number of kits at the time of insemination (21 days). Bíró-Németh et al. (1988) noted a relationship between the number of suckling rabbits at the time of mating and CR. Higher CR were demonstrated by Szendrő (1992) for does with small litters mated immediately after kindling compared to those with large litters. In the group mated 10 days after parturition, there was no relationship between the two traits. In our experiment most of the does were inseminated 2 or 3 weeks after kindling. It is assumed that at this time there is not any connection between previous litter size and the results of AI (CR and LS).

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Table 1

The effect of time of re-breeding on CR and LS

Re-breeding (days after kindling)	No of insemina-tions	No of kind-lings	Conception rate %	Litter size at birth	
				$\bar{x}$	s
Before weaning					
1 - 10	7	2	26.6	10.50	3.54
11 - 15	35	6	17.1	8.33	1.97
16 - 20	101	72	71.3	8.60	3.16
21 - 25	65	46	70.8	8.57	3.10
26 - 30	25	14	56.0	7.14	3.18
31 - 40	127	98	77.2	7.63	3.34
1 - 40	360	238	66.1	8.52	
After weaning					
41 - 60	102	88	86.3	7.80	2.93
above 60	89	72	80.9	7.42	2.40
40 <	191	160	83.8	7.63	

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Table 2

Effect of age of does and season on the conception rate (CR) and litter size (LS)

Age of does months	Virgin does					Suckling does					Weaned does					All together			
	No ins	No kin	CR %	LS $\bar{x}$	LS s	No ins	No kin	CR %	LS $\bar{x}$	LS s	No ins	No kin	CR %	LS $\bar{x}$	LS s	No ins	No kin	CR %	LS
4 - 5	62	58	93.5	8.07	2.10	-	-	-	-	-	-	-	-	-	-				
6 - 7	33	29	87.9	8.03	2.17	69	48	69.6	7.63	3.12	13	8	61.5	7.75	4.62				
8 - 9	-	-	-	-	-	65	49	75.4	8.71	3.27	24	19	79.2	8.11	3.10				
10 -13						85	58	68.2	8.57	2.39	39	32	82.1	8.88	2.30				
14 -17						44	31	70.5	8.19	4.09	53	44	83.0	7.70	2.69				
18 -25						71	43	60.6	7.70	2.94	50	37	74.0	6.35	3.00				
25<						16	6	37.5	4.67	3.39	17	11	64.7	7.27	2.37				
Total	95	87	91.6	8.06	-	350	235	67.1	8.10	-	196	151	77.0	7.64	-				
Season months																			
O - J	15	15	100.0	8.20	2.98	14	11	78.6	8.64	2.38	6	3	50.0	7.00	3.61	35	29	82.9	8.24
F - M	22	22	100.0	8.09	2.37	94	74	78.7	8.91	3.18	51	44	86.3	8.32	2.95	167	140	83.8	8.60
A - M	19	18	94.7	8.50	1.72	31	29	93.6	8.48	3.42	3	2	66.7	9.50	0.71	53	49	92.5	8.53
J - J	5	4	80.0	10.25	3.40	77	54	70.1	7.31	2.81	24	18	75.0	6.72	2.63	106	76	71.7	7.32
A - S	8	8	100.0	7.75	1.39	116	57	49.1	7.81	2.77	39	33	84.6	6.19	2.49	163	98	60.1	7.26
O - N	22	17	77.3	7.53	2.24	31	18	58.1	8.67	2.99	54	43	79.6	7.14	2.67	107	78	72.9	7.58
Total	91	84	92.3	8.15	-	363	243	66.9	8.22	-	177	143	80.8	7.26	-	631	470	74.5	7.91

Remarks: No ins = No of inseminations No kin = No of kindlings

Table 3

Effect of body weight of does on CR and LS
(only suckling and weaned does)

Weight of does kg	Suckling does					Weaned does					Overall				
	No ins	No kin	CR %	LS $\bar{x}$	LS s	No ins	No kin	CR %	LS $\bar{x}$	LS s	No ins	No kin	CR %	LS $\bar{x}$	LS s
under 3.5	21	14	66.7	8.38	2.98	10	7	70.0	8.14	2.19	31	21	67.7	8.29	2.61
3.51 - 4.00	134	84	62.7	8.46	2.93	59	49	83.1	7.63	2.46	193	133	68.9	8.15	2.79
4.01 - 4.50	156	100	64.1	7.64	3.24	96	77	80.2	7.57	2.73	252	177	70.2	7.61	3.02
above 4.5	42	36	85.7	8.19	3.54	15	13	86.7	7.46	3.84	57	49	86.0	8.00	3.59

Remarks: No ins = No of inseminations No kin = No of kindlings

Table 4

Effects of suckling animals at the time of AI on the CR and LS
(only suckling does)

Previous LS at 21 days	No of in-semination	No of kindling	Conception rate %	Litter size $\bar{x}$	Litter size s
1 - 5	82	55	67.1	7.64	3.00
6 - 7	87	59	67.8	8.03	2.95
8 - 9	130	77	59.2	8.77	3.30
10 -11	46	32	69.6	7.59	3.52