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THE INFLUENCE OF POSTPARTUM INSEMINATION ON LITTER SIZE AND GROWTH OF NEW ZEALAND WHITE RABBITS

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The economy of rabbit production is highly dependend on the number of young rabbits that is reared per doe and year, of similar importance is a reduction of the interval between two litters.

Paufler et al. (1979) were the first who showed insemination 1-3 days post partum by using the synthetic releasing hormon (LH-RH) - in contrary to HCG or PLH - does not give cause for antibodies and therefore reduction of the conception rate, even if it is applied quite often (up to 10 insemination periods). In this research does of different ages and litter performances were used. But sometimes influences of the age were distinctly shown. For instance the age of the does was negatively correlated to the litter size (r= -0,43).
In the present research the influence of the insemination sequence on the development of litter size, weights and mortality of descendants was to be studied by working with juvenile does of the same age. Each insemination interval lasted 33 days. The question in how far the losses during suckling period can be reduced by litter equalization immediately after birth was included.

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1.) MATERIAL AND METHOD

45 juvenile New Zealand White does were used in the experiment. The 32nd day of pregnancy the birth was released by an injection of Oxytocin in case the does had not littered until then (approximative 30%). The litters were equalized so that all does had about the same number of kids.
The 33rd day after the preceding insemination the rabbits were inseminated again. Altogether 10 periods of insemination were used for this research.
The rabbits were put into partly air-conditioned stables without windows in flatdeck-cages with shut litter boxes aside. During the whole test period the rabbits had light for 12 hours. The temperature never became lower than 15°C.

The rabbits were fed with a commercial all-mash rabbit feed with 16,5% crude protein and 14% crude fiber. Feed could be consumed ad libitum, except for does who did not suckle; for them the fodder intake was limited to 5 hours. For diatetic reasons the does could eat barley straw two days a week.

The does only once a day could enter the nestbox to suckle the young ones. The individual birth weights of all animals were registered in the 2.,4.,6. and 8. litter period. At the same time they were signed with a marking pencil. Further on the individual determination of weight followed the 7., 14., 21. and 25. day of life.
The young ones were weaned at an age of 25 days and separated in the fattening stable.

2.) RESULTS

2.1. Conception and litter size

The average conception rate was 73,7%. The results were worst for the 9. insemination period with 61,4% and best in the 4. insemination period with 84,1% (table 1). Does who did not suckle during pregnancy got pregnant with 84,1%, suckling does only with 72,1%.

The average litter size was 7,6. Concerning the litter size there were nearly no differences between does who suckled and those who did not suckle.
The largest litters were found in the 5.-8. insemination period. Starting with the 9. period there is a rend to a diminution of litter size (table 1). Related to the number of weaned young ones at the 25. life day, this cannot be said because of the lower losses during the suckling period (table 1). Therefore for the parameters conception and weaned descendants per litter, it is not yet possible to define the time when the economical optimum of weaned kids per litter is reached.

Out of the totally born young ones of all insemination periods an average amount of 7,7% still born was found. Conclusions between the percentage of still borns and the litter series were not to be seen. There had also been unimportant relations between the litter size and the number of still borns (r=0,16).

On the other hand there are relations between the duration of litter interval and the still birth. Whereas the amount of still-borns was 4,9% for does who did not suckle in the pre-period it was 9,4% for does who did suckle. Because of the large variation this difference is not significant, but near to the supposed threshold of significance of $p < 5\%$. The development of the doe's weights did not give any indication to a shortness of nutritive substance as a reason for the high amount of still borns. The average weight was 5,13 kg for does who did not suckle in the pre-period and 5,10 kg for those who did suckle. Also the birth weights were unimportantly lower for still born young ones than for living. It still has to be tested whether it comes to an undercooling immidiately after birth because of the little amount of hair that is available to build a nest as a result of the short intervals of litterering.

Out of the young ones that were born alife on an average 11,5% died until weaning. The first litter has not been taken into consideration here to be able to find out the influence of the preceding litter interval. Excluding the does who did not suckle at the time when being inseminated 15,5% of the young ones died

until the 25. day of life, where as only 9,2% of the suckling ones died. Interactions between mortality and interval of insemination were not to be seen in this experiment.

The weight at the 25. day at weaning on the average was 469 g. There was a continuing increase of weaning weight until the 6. litter period. The average weight of young ones of does who did not suckle and those who suckled in the preceding period nearly was the same. So the doe's stress of being in lactation and gravidation at the same time did not show any negative influences on the suckling performance.
During the whole testing period of 10 insemination periods 11,7% of the does died.

2.2. Development of single animals

The growth of 1260 young ones was investigated in the 2.,4.,6. and 8. insemination period. The kids were weighed and signed immediately after birth. Further inquiries of weight were made the 7.,14.,21. and 25. day.

Highly significant differences already exists between the birth weights. The birth weights for the young ones of does which did not suckle during pregnancy with an average of 55 g was 8% lower than the one of does who had suckled (table 3). These differences only were significant until the 21. day of life. This opposition shows that there is no negative influence of the doe's stress caused by being in lactation and gravidation at the same time if there is no lack in the nutritive supply.

In the studied 4 periods the result has been a little better in comparison to the general average of all 10 periods with a mortality rate of 10,3% till weaning. More than 50% of the losses during the suckling period took place during the first week of life. The average weight of the young ones who died was clearly lower than of those who survived with average weights of 44 g of rabbits who died in the first week and 114 g for those who died in the second week. These facts let presume that first of all the weaker animals who did not have the possibility to get enough milk

died of hunger. This also is confirmed by the differences of birth weight. Having a birth weight of 49,6 g the young ones who died during the suckling period weighed 16% less than the average of all born ones. The losses of the young ones added to a doe in the litter equalization were significantly higher than the own ones as they came out of bigger litters (table 4). Nevertheless the added animals were able to compensate the highly significant differences of birth weights of about 18% to a significant difference of 5% until the 25. day of life.

Whereas mortality rate during the suckling period for the own young ones was 7,2%, it was 10,4% for the added ones. Considering that the added kids came of litters with 9 and more kids, in which litters the losses are about 20% resulting of the limited number of teats per doe (Paufler et al. 1979), in the litter equalization causes a clear diminution of mortality. As a result of the over proportionaly increasing losses in litters with more than 9 kids, an increase of the litter size only makes sense in addition to a synchonization of birth, a litter equalization and at the same time selection on a higher number of teats (Fleischhauer, et al. 1986).

Finally the weights of the kids were differentiated according to sexes. The male animals were 3% heavier at the birth than their sisters. This difference in weight no longer existed after the 14. day of living.

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SUMMARY

45 juvenile New Zealand White does would inseminated 10 times all 33 days (1-2 days postpartum).
The birth would synchronized with an oxytocin injection.
The kids would weaned at the 25th day of life.
The average conception rate with an variation from 84,1 % (4th insemination) till 61,4 % (9th insemination) amounted 73,7 %.
It is higher of the does who have not been suckling during pregnancy.
The average litter interval lasted 42 days.
Per doe cage during the experiment (355 days) 44 kids were weaned without remontation of died does.
The average litter size of 7,6 shows the tendency to decrease after the 8th insemination period. But in consequence of decreasing stillbirths the number of weaned is constant till the 10th litter.

ZUSAMMENFASSUNG

45 Junghäsinnen der Rasse Neuseeländer, weiß, wurden 10 mal alle 33 Tage (d.h. 1-2 Tage postpartum) besamt. Die Geburt wurde mit Oxytocin ausgelöst, wenn die Häsinnen bis zum 31. Tage nicht geworfen hatten. Die Jungtiere wurden am 25. Lebenstag abgesetzt.
Die Häsinnenverluste betrugen 11,7%.
Die durchschnittliche Konzeptionsrate betrug 73,7 % mit einer Variation von 84,1 % (4. Besamung) bis 61,4 % (9. Besamung). Sie war höher bei Häsinnen, die während der Trächtigkeit nicht säugten.
Die durchschnittliche Zwischenwurfzeit betrug 42 Tage.
Je Häsinnenkäfig wurden ohne Ersatz der Verluste im Versuchungszeitraum (355 Tage) 44 Jungtiere abgesetzt.
Die durchschnittliche Wurfgröße von 7,6 hat eine abnehmende Tendenz nach der 8. Besamung. Aufgrund weniger Testgeborenen blieb die Zahl der abgesetzten Jungtiere bis zur 10. Besamung konstant.

LITERATURE:

Fleischhauer, H., Schlolaut, W., Lange, K. (1985):
Influence of number of teats on rearing performance of rabbits
J. Appl. Rabbit Res., 8, 4, 174 - 176

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Post partal insemination in rabbits with ovulation induction through use of LH - RH.
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Table 1

Average Fertility results

Insemination sequence	Conception rate			Average born kids per litter			Still born kids per litter		
	total	Influence of preperiod does not suckling	does suckling	total	Influence of preperiod does not suckling	does suckling	total	Influence of preperiod does not suckling	does suckling
	%	%	%	number	number	number	%	%	%
1	63,3			6,2			6,3		
2	81,4	100,0	68,0	7,0	6,1	7,9	11,0	6,4	23,7
3	73,8	100,0	67,7	7,7	7,9	7,7	13,7	3,2	17,5
4	84,1	76,9	87,1	7,0	6,6	7,2	6,5	4,5	7,2
5	80,0	88,9	77,8	8,3	8,5	8,3	6,3	8,8	5,5
6	73,3	77,8	72,2	8,5	9,1	8,3	9,7	4,7	11,1
7	81,8	90,9	78,8	8,1	9,6	7,6	5,1	6,3	4,6
8	72,8	77,8	72,2	8,4	8,0	8,5	9,7	0,0	12,2
9	61,4	69,2	58,1	6,7	6,1	7,0	6,6	7,2	6,3
10	68,9	76,5	64,3	7,8	8,0	7,7	3,7	1,9	5,1
Average	73,7			7,6			7,7		
Average without first Insemination	75,3	84,1	72,1	7,8	7,6	7,8	7,9	4,9	9,4

+) All perinatal dead.

Table 2

Average weaning weights and mortality of liveborn till weaning at 25. day of live

Insemination sequence	Number of weaned kids			Weaning weights			Mortality till weaning		
		Influence of preperiod			Influence of preperiod			Influence of preperiod	
	total number	does not suckling number	does suckling number	total g	does not suckling g	does suckling g	total %	does not suckling %	does suckling %
1	4,6			421			20,2		
2	5,3	5,2	5,5	453	443	463	14,3	14,7	13,9
3	6,4	5,8	6,6	468	461	471	9,6	20,7	5,6
4	5,9	5,8	6,0	476	483	470	8,3	9,4	8,0
5	6,9	7,5	6,7	478	475	485	11,1	7,7	12,9
6	6,5	6,1	6,7	492	500	496	10,7	18,9	8,5
7	6,4	5,9	6,5	475	491	477	15,8	31,4	8,5
8	6,6	6,9	6,5	473	432	490	12,1	14,3	11,4
9	6,1	6,1	6,2	466	474	473	5,7	8,4	4,2
10	6,8	6,1	6,9	483	501	475	9,8	12,2	8,1
Average	6,2			469			12,0		
Average without first Insemination	6,3	6,1	6,4	474	473	480	11,5	15,5	9,2

Table 3

Development of liveweight and mortality of individualy weighed kids from the 2nd, 4th, 6th and

		Total		P r e p e r i o d				Test of significa
				not suckling		suckling		
		$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v	
n		1260		457		803		
birth weight	g	57,6	19,6	54,8	19,0	59,2	19,3	++
Weight at 7th day of life	g	161	23,4	156	24,9	164	22,5	++
Weight at 14th day of life	g	289	18,9	276	22,2	296	16,6	++
Weight at 21th day of life	g	400	17,8	387	21,6	407	15,4	++
Weight at 25th day of life	g	484	18,3	479	16,7	487	17,6	-
Losses 1. - 7. day of life	%	5,6		5,4		5,6		
Losses 8. - 14. day of life	%	2,3		3,5		1,6		
Losses 15. - 21. day of life	%	2,1		3,7		1,2		
Losses 22. - 25. day of life	%	0,3		0,4		0,2		
Losses 1. - 25. day of life	%	10,3		13,0		8,6		

++ = highly significant ($p < 1$)

- = not significant

Table 4

Liveweight and mortality development of the does own or added foreign kids and the different sexes

		Influence of litter equalisation					Influence of sex				
		Does own kids		added foreign kids		Significance-test	male kids		female kids		Signific test
		$\bar{x}$	v	$\bar{x}$	v		$\bar{x}$	v	$\bar{x}$	v	
n		249		143			556		574		
Birth weight	g	63,7	17,0	54,1	19,2	++	59,4	18,3	57,7	18,4	++
Weight at 7th day of life	g	165	21,5	148	26,9	++	164	23,5	159	22,6	+
Weight at 14th day of life	g	289	17,8	274	22,1	++	292	18,5	288	18,6	-
Weight at 21th day of life	g	403	16,6	379	21,0	++	403	18,4	398	17,1	-
Weight at 25th day of life	g	485	17,0	463	21,7	+	484	19,0	483	17,6	-
Losses 1. - 7th day of life	%	5,2		6,9							
Losses 8. - 14th day of life	%	0,8		2,1							
Losses 15. - 21th day of life	%	1,2		0,7							
Losses 22. - 25th day of life	%	0,0		0,7							
Losses 1. - 25th day of life	%	7,2		10,4							

+ = significant ($p < 5$ %)

++ = highly significant ($p < 1$ %)

- = not significant