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ON THE GROWTH PERFORMANCE OF RABBITS
RAISED IN LITTERS OF 11 KITS BY MULTIPAROUS RABBIT DOES**

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IMPACT OF THE ACCESS TIME TO THE FEEDER BEFORE WEANING ON THE GROWTH PERFORMANCE OF RABBITS RAISED IN LITTERS OF 11 KITS BY MULTIPAROUS RABBIT DOES

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ABSTRACT

The breeding of 11 rabbits per litter is possible on farms where the technicality and the quality of young rabbits at birth is good. The 1st objective is to raise 11 young rabbits per rabbit does to study the growth of these young rabbits, and the 2nd is to study the effects of feed restriction applied 8 hours a day during the 10 days before the weaning. Forty rabbits does and their 11 young rabbits were divided into 2 groups; the 1st one were fed ad libitum while the other one had access to the feeder only from 4pm to 8am each day from 25 d of age to weaning (35 d). From weaning to 70 d of age, all rabbits received the same feed and had access to the feeder 12 h per day. The sanitary condition of this trial was very good in maternity as well as in fattening. There was no effect of feed restriction during the maternity period on the weight of young rabbits (935 vs. 929 g for ad libitum and restricted groups, $P > 0.05$) or the feed intake recorded (712 vs. 706 g/d/cage; $P > 0.05$). At 42, 49 and 56 days of age, rabbits from ad libitum group were heavier than rabbits with restricted access to the feeder (between + 3% and + 2.5%, $P < 0.01$). At 63 and 70 days of age, the weights between the 2 groups were similar ($P > 0.05$). The growth rate over the period 35-49 days of age was higher for rabbit with the ad libitum access compared to the rabbits that had a restricted access to the feeder. (5% variation, $P < 0.001$). It was not different in the other periods studied. In conclusion, the reduction of access time to the feeder had no impact on the growth performances and health status of the rabbits. Under the conditions of this trial, breeding 11 rabbits per rabbit does allows good zootechnical results, consistent with the standard Hyplus-Grimaud Group.

Key words: Nutrition, feeding, young rabbits, performance, access time.

INTRODUCTION

Thanks to genetic developments and adapted nutritional feeds, it is now possible to breed up to 11 young rabbits per multiparous rabbit does. This is only possible in farms where the sanitary status is well controlled, and in which there is a very good technical mastery of the breeder, leading in particular to good quality young rabbits at birth (C. Barré, Hypharm - Grimaud Group, Personal communication, 2019). This practice makes it possible to maximize the productivity of rabbit farms, by increasing the number of weaned rabbits, and therefore to improve productivity in number of kilograms sold. Few scientific studies have been published about 11 young rabbits left under the mother, which is the originality of this work. In addition, the study also relates to the interest or not to carry out a limited access to the feed of the litter before weaning to know the impact on the viability and the technical performances of the rabbits. The purpose of this study is twofold. The first is to study the growth of young rabbits, which are raised to 11 rabbits per lactating multiparous rabbit does, and the second is to study the effects of an 8 h daily fasting feed, the week before the weaning of young rabbits.

MATERIALS AND METHODS

Animals and experimental design

The trial was conducted at the NEOVIA research station located in Saint Nolf (France, 56) between June 15 and July 31, 2018. It was carried out in maternity (from 25 to 35 days of age of young rabbits) following with the fattening (from 35 to 70 days of age).

In maternity, 40 non-pregnant Hyplus PS19 rabbits and their litters (resulting from insemination with the PS59male) were separated into 2 groups according to their rank of litter, the weight of female, and the average weight of rabbits. The average range rank was 5.9. Each litter had 11 young rabbits at the time of equalization. The objective was to study the growth of litters of 11 rabbits. The first group of rabbits does and young rabbits was fed without time restrictions (group ad libitum, AL) while the other had access to the feeder only from 4 p.m. to 8 a.m. each day between 25 and 35 days of age. A commercial pre-weaning feed was used during this period (Table 1). The feed was the same for rabbit does and young rabbits.

Table 1: Composition of the feeds (raw, analytical values)

	<i>Pre weaning feed ; 25-35d</i>	<i>Fattening feed ; 35-70d</i>
Theoretical DE (kcal/kg)	2350	2480
Protein %	14.5	15.7
Fat %	2.8	3.3
Starch %	12.0	12.0
NDF - calculated, %	35.5	34.0
ADF - calculated, %	20.1	19.9
Lignin - calculated, %	5.3	6.0

A total of 294 young rabbits from the maternity trial were selected for the fattening trial, from 35 to 70 days of age. The criterion to allocate groups was the weight at weaning and their maternal origin, respecting the numerical difference observed on all the rabbits. The rabbits were placed in collective cages, at the rate of 7 animals per cage. The 21 cages in the same group had a different weight, but the average weight of the 21 cages in the same group was as close as possible. From weaning, all rabbits received the same commercial fattening feed (Table 1), and were feed restricted in the same way (12 hours of access to the feeder, from noon to midnight).

Controls and measures

In maternity, young rabbits, which were individually identified, were weighed ~~individually~~ at 25 and 35 days of age; as well as the rabbit does. Feed intake per cage was also recorded. This intake was that of the rabbit does and its young rabbits, it was not possible to differentiate the intake of rabbits does from that of young rabbits. Mortality was recorded daily.

During the fattening period, the rabbits were weighed individually each week between weaning and 70 days of age. Overall intake was measured on the same dates. Morbidity control was performed on all animals during each weighing. Mortality was recorded daily and the apparent causes of death were recorded.

Statistical Analysis

Weight, ADG (Average Daily Gain), feed intake and FCR (Feed Conversion Ratio) data were analyzed by analysis of variance (ANOVA). Mortality and morbidity data were compared by a frequency comparison test (Chi²).

The effect retained in the model was the diet received in maternity. The data was analyzed with R software (version 3.5.0).

RESULTS AND DISCUSSION

Maternity

The health status in maternity was very good, there were no dead rabbit does or rabbit does showing signs of disease. Among the 2 groups of 220 young rabbits followed in maternity, 2 died in the ad libitum group and 5 died among those with restricted access to the feeder, ie 0.91% and 2.27% mortality respectively ($P > 0.05$).

Tableau 2: Performances of rabbit does in maternity (n = 20).

	Access to the feeder			
	Ad libitum	Restricted	SD	P-value
Body weight 25d, g	4823	4807	377	0.90
Body weight 35d, g	4658	4653	338	0.96

The weight of the rabbit does was not affected by the type of access to the feeder (Table 2). It should be noted that at 35 days, the rabbit does were not pregnant because they had not been re-inseminated. The results of growth of the rabbit does as well as the average daily intake per cage are presented in Table 3. These results show that the rabbit does and their litters were able to adapt to a time restriction of access to the feed. Feed intake per cage was very close between the 2 groups ($P > 0.05$). The growth of young rabbits was not impaired by the reduction in access to feed, the weights at 25 and 35 days of age were quite similar between the 2 groups. The weight at weaning observed in this test is completely consistent with the growth curve of rabbit Grimaud PS19xPS59 (930 g). These results are different from those obtained by Bignon L. et al, 2013; these authors demonstrated a negative effect of litters of 11 young rabbits on the performance and mortality of young rabbits in maternity.

Table 3: Growth of young rabbits and total feed intake (rabbit does and young rabbits) in maternity

	Access to the feeder			
	Ad libitum	Restricted	SD	P-value
Body weight 25d, g	491	491	38	0.96
Body weight 35d, g	935	929	51	0.69
Intake per cage 25-35d, g/d	712	706	90	0.82

Fattening

The health status in fattening was very good, and only one rabbit died from the ad libitum group in maternity. Morbidity was also very low since only 2 rabbits presented signs of disease, they were recorded at 56 days of age, they came from the restricted group in maternity. Both had respiratory problems. These results show that litters of 11 young rabbits, feed restricted or not during the pre-weaning period do not present any health problems during the fattening period, under the conditions of this trial (hourly rationing of 12 hours per day from weaning to 70 days of age).

Table 4 presents the growth performance of fattening rabbits. At weaning, 10.9 and 10.8 rabbits ($SD=0.5$) were present for the two groups respectively. The weight was equivalent between the 2 groups, but at 42, 49 and 56 days, the rabbits from ad libitum group before weaning, became heavier (between + 3% and + 2.5%, $P < 0.01$) than rabbits with restricted access to the feeder. At the end of the fattening period, at 63 and 70 days of age, the weights between the 2 groups had become similar again ($P > 0.05$). The weight at 70 days of age is consistent with the value indicated in the Hypharm standard (2560 g).

Regarding the ADG, during the first 2 weeks of fattening, it was higher for the group fed ad libitum before weaning than for the restricted group (+ 8% and + 3% respectively, $P < 0.05$). Logically, the ADG 35-49 days of age was different depending on the type of access to the feeder (5% difference, $P < 0.0001$). Over the last 3 weeks of fattening, as well as over the entire fattening period, the ADG between the 2 groups were comparable ($P > 0.05$).

Growth increased at the start of fattening when the rabbits were fed ad libitum in pre-weaning, but thanks to the compensatory growth phenomenon, the final body weight was not different between the 2 groups at 70 days of age. This phenomenon is well known in rabbit breeding.

There was no difference in intake or FCR between the two groups ($P > 0.05$). However, although these results were not statistically significant, numerical variations could be observed regarding the feed intake of fattening rabbits. At the start of fattening period, restricted rabbits seemed to consume slightly less than rabbits fed ad libitum in pre-weaning, which could explain the slight growth retardation observed at the start of fattening period. The FCR is similar between the 2 groups ($P > 0.05$).

Table 4: Growth performance of fattening rabbits

	Access to the feeder		SD	P-value
	Ad libitum	Restricted		
Body weight 35d, g	932	919	79	NS
Body weight 49d, g	1698	1642	127	0.0002
Body weight 70d, g	2686	2643	190	NS
ADG 35-49, g/d	54.5	51.6	5.6	<0.0001
ADG 49-70d, g/d	47.0	47.5	6.0	NS
ADG 35-70d, g/d	50.0	49.2	4.6	NS
Feed Intake 35-49, g/d	101.0	96.3	8.7	NS
Feed Intake 49-70j, g/d	141.8	140.1	15.5	NS
Feed Intake 35-70, g/d	126.2	123.3	12.3	NS
FCR 35-49	1.85	1.87	0.10	NS
FCR 49-70	3.02	2.94	0.28	NS
FCR 35-70	2.52	2.51	0.18	NS

ADG: Average Daily Gain. FCR: Feed Conversion Ratio

The effect of the access restriction to the feeder before weaning had no effect on performance during the fattening of these same young rabbits. Indeed, as it has already been pointed out previously, the animals adapt to new feed distribution schedules, after a short adaptation time. This ability to adapt to hourly rationing has already been demonstrated (Duperray et al., 2017).

Feed intake was slightly reduced (not significant) when the rabbits were restricted during pre-weaning period, but their weights at 70 days of age were similar between the groups, which might allow a slight gain in index at the end of the fattening. An economic calculation would allow us to see if these small variations would have a financial impact or not.

CONCLUSIONS

The management of 11 rabbits per litter in multiparous rabbit does (parity greater than 3) with a good health status allowed good zootechnical results. However, it is recalled that to obtain good results, this practice can only be done within a farm with good technicality and good quality of young rabbits at birth. Furthermore, reducing the access time to the feeder before weaning had no impact on the growth performance of young rabbits. This practice of restricting access to the feeder is more restrictive than unlimited access to feed, and does not generate any particular benefits, either in terms of health status or growth performance. This practice is therefore not recommended to be applied in commercial rabbitries

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Impact of the access time to the feeder before weaning on the growth performance of rabbits raised in litters of 11 rabbits per multiparous rabbit does

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Context

- Thanks to genetic developments and adapted nutritional feeds, it is now possible to breed up to 11 young rabbits per multiparous rabbit does (parity greater than 3).
- It is only possible in farms where the sanitary status is well controlled, and in which there is a very good technical mastery of the breeder, leading in particular to good quality young rabbits at birth (C. Barré, Hypharm - Grimaud Group, Personal communication, 2019).
- This practice makes it possible to maximize the productivity of rabbit farms, by increasing the number of weaned rabbits, and therefore to improve productivity in number of kilograms sold.
- The purpose of this study is twofold:
 - The first is to study the growth of young rabbits, which are raised to 11 rabbits per lactating multiparous rabbit does
 - The second is to study the effects of an 8 h daily fasting feed, the week before the weaning of young rabbits.

Materials & Methods

- 40 non-pregnant multiparous does and their litters (PS119xPS59) were allocated in 2 groups:
 - AL: fed without time restrictions (group Ad Libitum)
 - R: limited access to the feeder, from 4 p.m. to 8 a.m. each day between 25 and 35 days of age (group Restricted)
- In fattening, 294 young rabbits were raised until 70 d of age, in collective cages (21 cages x 7 rabbits x 2 groups) and were fed restricted (12 hours of access to the feeder, from noon to midnight).

	Pre weaning feed ; 25-35d	Fattening feed ; 35-70d
Theoretical DE (kcal/kg)	2350	2480
Protein %	14.5	15.7
Fat %	2.8	3.3
Starch %	12.0	12.0
Crude fiber, %	16.3	15.8

- Growth performances and sanitary status were registered.
- Statistical analysis: Weight, ADG, feed intake and FCR data were analyzed by analysis of variance (ANOVA). Mortality and morbidity data were compared by a frequency comparison test (Chi²).

Results in maternity

- No deaths, good sanitary status
- No difference in growth performance for does and for young rabbits

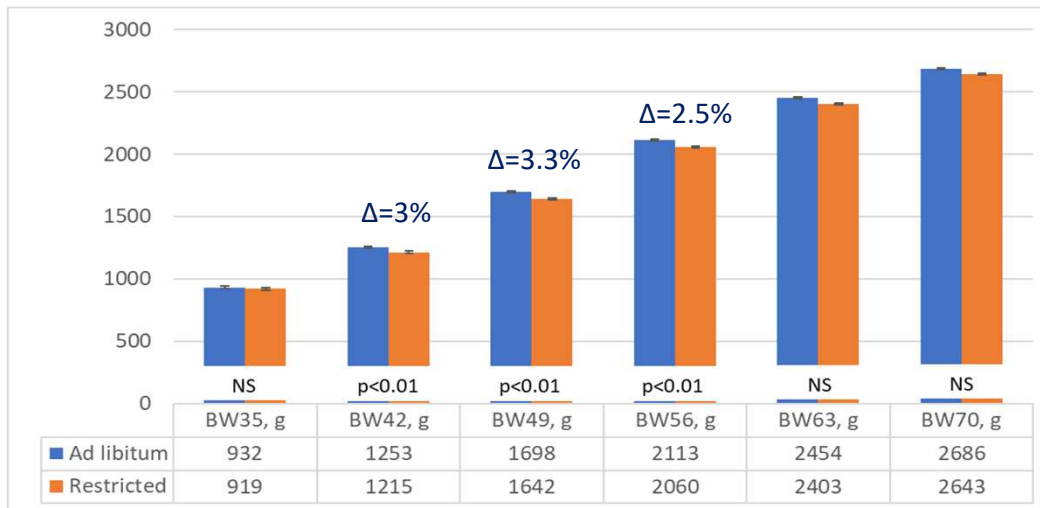
	Access to the feeder		SD	P-value
	Ad libitum	Restricted		
Body weight of does 25d, g	4823	4807	377	0.90
Body weight of does 35d, g	4658	4653	338	0.96

	Access to the feeder		SD	P-value
	Ad libitum	Restricted		
Body weight of young rabbits 25d, g	491	491	38	0.96
Body weight of young rabbits 35d, g	935	929	51	0.69
Intake per cage 25-35d, g/d	712	706 $\Delta=0.8\%$	90	0.82

- Adaptation to a time restriction of access to the feed
- Results different from those obtained by Bignon L. et al, 2013 (negative effect of litters of 11 young rabbits on performance & mortality of young rabbits in maternity)
- Consistent with the growth curve of rabbit Hypharm PS19xPS59 (930 g at weaning).

Results in fattening

- From 42 to 56d, higher BW for AL rabbits ($p < 0.01$) but no difference in final BW (consistent with the value indicated in the Hypharm standard (2560 g).
- ADG 35-49 different (5% difference, $P < 0.0001$). Global 35-70d similar
- No difference in intake or FCR between the two groups



	Access to the feeder in maternity			
	Ad libitum	Restricted	SD	P-value
ADG 35-49, g/d	54.5	51.6	5.6	<0.0001
ADG 49-70d, g/d	47.0	47.5	6.0	NS
ADG 35-70d, g/d	50.0	49.2	4.6	NS
Feed Intake 35-49, g/d	101.0	96.3	8.7	NS
Feed Intake 49-70j, g/d	141.8	140.1	15.5	NS
Feed Intake 35-70, g/d	126.2	123.3	12.3	NS

- Compensatory growth phenomenon leading to a similar final body weight
- Adaptation to new feed distribution schedules after a short adaptation time, already demonstrated (Duperray et al., 2017).

Conclusion

- This study allowed to answer to the 2 aims :
 - Reducing the access time to the feeder before weaning had no impact on the growth performance of young rabbits in a well controlled sanitary status, and does not generate any particular benefits, either in terms of health status or growth performance.
 - Management of 11 rabbits per litter in multiparous rabbit does (parity greater than 3) with a good health status allowed good zootechnical results.
However, this practice can only be done within a farm with good technicality and good quality of young rabbits at birth, and with adapted feed for rabbit does (energy, protein, fat).

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Thank You

