

INFLUENCE OF THE DIET USED BEFORE AND AFTER THE FIRST MATING ON REPRODUCTIVE PERFORMANCE OF RABBITS DOES

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ABSTRACT : The aim of this study was to verify the influence of different diets used before and after the first mating on reproductive performance of does. 100 New Zealand White females growing rabbits (50 days old) were fed two different diets with concentrate pellets: in the first diet (fibrous diet - F) crude fibre contents (CF) were 22.8% DM; in the second diet (normal diet - T) CF were 18.0% DM. From day 10 of the first pregnancy, 50 does (25 does for the F group and 25 does for T group) received a traditional lactating concentrate (L) with Crude Protein (CP) 18.3% DM and Digestible Energy (DE) 11.37 MJ/kg DM. The other 50 does received, in the same time, but in different feeders, two different feeds: the E diet (energetic diet) with CP 23.4% DM and DE 14.59 MJ/kg DM and the F diet. Using F diet in the growing period the rabbits increase the

feed intake (119.1 vs 110.3 g/d/kg LW^{0.75}) during the successive lactations and more young rabbits were weaned (8.04 vs 7.69) and the litters were heavier at 21 (2685 g vs 2584 g) and 35 days (7421 g vs 6896 g). However the two different diets used caused a decrease of food consumption (111.3 vs 117.1 g/d/kg LW^{0.75}). The consumption of E food was higher than F and the rabbits of this group showed the highest DE intake (1.25 vs 1.19 MJ/d/ LW^{0.75}) and DP intake (15.08 vs 13.31 g/d/kg LW^{0.75}). Also the litters at 21 (2698 g vs 2588 g) and 35 days (7321 g vs 7038 g) were heavier. The obtained data confirm the efficiency of the administration during the growing period of a diet rich in fibre. The same data cannot give sufficient information to judge the use of 2 free choice diets during the reproduction period.

RESUME : Influence du régime utilisé avant et après la première saillie sur les performances de reproduction des lapines.

Le but de cette étude est d'évaluer l'influence de régimes alimentaires différents sur les performances de reproduction des lapines, avant et après le premier accouplement. On a utilisé deux aliments concentrés différents distribués à 100 lapines NZW du début de l'essai à 50 jours, jusqu'au 10^{ème} jour de la première gestation. Le premier aliment (aliment fibre - F) a un contenu en cellulose brute de 22,8% M.S.; le deuxième aliment (aliment témoin - T) contient 18,0% de cellulose brute/M.S. A compter du 10^{ème} jour de la première gestation, et pendant une année, 50 lapines (25 du groupe F et 25 du groupe T) ont reçu un aliment traditionnel pour lactation (L) contenant 18,3% de protéines brutes et 11,37 MJ/kg M.S. d'énergie digestible.; les autres 50 lapines ont reçu au choix et dans des mangeoires différentes, 2 aliments : soit l'aliment E (énergétique) avec une teneur en matières azotées de 23,4% et une teneur en E.D. de 14,59 MJ/kg/M.S.; soit l'aliment F.

L'aliment fibreux (F) administré durant la croissance a permis d'augmenter la consommation des lapines (119,1 vs 110,3 g/j/kg P.Vit^{0.75}) durant les lactations successives, de sevrer plus de lapereaux (8,04 vs 7,69) et d'avoir des portées plus lourdes à 21 (2685 g vs 2584 g) et 35 jours (7421 g vs 6896 g). L'utilisation de 2 aliments différents au cours de la lactation a diminué la consommation d'aliment (111,3 vs 117,1 g/d/kg^{0.75}), mais, la préférence pour l'aliment E a amené les lapines de ce groupe à ingérer une quantité plus élevée d'énergie digestible. (1,25 vs 1,19 MJ/d/LW^{0.75}) et de protéines digestibles (15,08 vs 13,31 g/d/kg LW^{0.75}). Les portées de ces lapines ont été les plus lourdes à 21 jours (2698 g vs 2588 g) et 35 jours (7321 g vs 7038 g). Les résultats obtenus confirment l'efficacité de l'administration de régimes riches en fibres durant la croissance, mais ils ne sont pas suffisants pour confirmer l'intérêt de 2 aliments en libre choix durant la période de reproduction.

INTRODUCTION

During the lactation period the does need foods with high energy and protein contents especially when the reproductive rhythm is intensive. Diets normally used contains sufficient proteins but not energy contents. This energy deficiency decreases milk production, the weight and the vitality of the young rabbits and the health of the females. For this reason, from the first lactation, it is necessary to use a diet with a high energy content. At the same time a high content of acid detergent fibre (ADF) is necessary for a correct function of digestive organs and it is not easy to prepare diets for this species with an energetic concentration (DE) of more than 2600 kcal of DE/kg. This level of DE can not be sufficient to cover the energetic needs of the does (PARIGI-BINI, 1992). To reduce the energetic deficiency which occurred during lactation, many authors (PARIGI-BINI *et al.*, 1994, 1995) suggest increasing the feed intake. These authors suggest using diets with high fibre contents in the weaning to first kindling period in order to increase the feed intake during the lactation period. Energetic requirements during lactation period are not constant but they increase with the milk production (PARIGI-BINI *et al.*, 1991). For this reason it could be useful to give the animals the opportunity to choose the diet with the availability of two feed with different energetic content.

The aim of this work was to study the influence of 1) the fibre content of the diet given before the first mating and 2) of the diet given during lactation on feed intake and reproductive performance during reproductive life, using a 3 x 2 factorial design.

MATERIALS AND METHODS

One hundred New Zealand White rabbits (NZW), aged 50 days, were randomly assigned to two groups (50 does control group = T; 50 does experimental group = F). Each group received *ad libitum*, from the trial start till the pregnancy diagnosis, two different pellet diets: T diet (commercial diet for growing) usually utilized in breeding and the F diet (experimental diet) containing more structural carbohydrates than the T diet (table 1). From day 10 of the first pregnancy, 50 does (25 does for the F group and 25 does for T group) received the commercial diet for lactating does (L diet). At the same time the other 50 does received, in different cribs, two different feeds: the E diet (energetic diet) and the F diet (table 1).

For the formulation of the E diet the percentage of CF, CP, DE, Ca and P of the F diet has been taken into consideration. Our objective was to obtain, in case of consumption of the same quantities of the two diets (E - F), the ingestion of a dry

Table 1 : Chemical analysis (% DM) and nutritive value (MJ/kg DM) of diets.

	Diets			
	T	F	E	L
Chemical analysis				
Dry matter	88.9	88.7	86.0	89.3
Organic matter	89.2	88.8	91.7	90.5
Crude protein	17.4	17.0	23.4	18.3
Ether extract	4.0	3.5	5.1	3.3
Crude fibre	18.0	22.8	9.5	17.0
NDF	40.9	48.9	21.8	33.9
ADF	22.4	28.3	12.1	21.2
Hemicelluloses	18.5	20.6	9.7	12.7
Cellulose	16.4	21.2	8.8	16.0
ADL	5.5	6.3	2.8	4.8
DP	12.22	11.42	18.30	12.74
Nutritive value				
Gross energy	18.83	18.47	19.31	18.42
DE	11.24	10.18	14.59	11.37
DP/DE g/MJ	10.86	11.20	12.54	11.20

matter similar in chemical composition as recommended for lactating does (LEBAS, 1989).

Digestibility trials were undergone for the four diets in 32 rabbits aged 70 days (PEREZ *et al.*, 1995). The E diet was used in the same quantities as the F diet, the digestibility coefficients were determined for difference. Chemical analysis of diets and faeces were conducted according to the AOAC methods (1984).

In 1996 a total of 399 kindlings were recorded. Animals were housed individually in wire cages in a natural airy shed with a photoperiod of 16 hours of light. Twelve days after kindling, the does were mated and remated 10 days after in case of no pregnancy diagnosis. The sterile rabbits after 3 consecutive inseminations were discarded from the trial. Number of live rabbits at birth, does and litter weights were recorded within 24 hours of kindling. The number of young rabbits was levelled at 8 in the primiparous and 9 in the pluriparous. Feed consumption (every week), does and litter weight (at the 21 d and the 35 d - weaning time) were recorded. Weekly control of feed consumption allowed the determination of the different consumptions of food in the cage with double cribs.

Diet after weaning (T diet vs F diet), diet of lactation (F + E vs L), the parity (primiparous vs multiparous) and their interactions were tested for significance by ANOVA (factorial model 3x2 - Package SPSS/PC+, 1986).

RESULTS AND DISCUSSION

Table 1 shows that L diet compared with the diet normally suggested for lactating does (LEBAS 1989) contained less DP (12.7 vs 15.0% DM), DE (11.4 vs 12.2 MJ/kg DM); DP/DE was lower than the optimum

one (11.2 vs 12.3). This is possible because in Italy rabbit breeders use a diet with less DE content in order to anticipate or reduce does enteropathologies.

The digestibility coefficients (CUD) were affected by the chemical composition of the diets (table 2). Particularly dry and organic matter, crude protein and energy showed CUD inversely correlated to the ADF content of the diet: CUD values were the highest in E diet and the lowest in F diet. The opposite trend was recorded for the components of the fibre fraction: CUD values were the highest in F diet and the lowest in E diet. The better digestibility of the fiber fractions of the F diet with highest ADF concentration, according to the data of GIDENNE *et al* (1991), could be due to the different nature of the fibre or, probably, to a different development of cellulolytic bacteria, owing to a variation of the caecal microflora (PARIGI-BINI, 1989).

The does reproductive performances are reported in table 3. The interactions didn't reach any statistical significance for each tested parameter. The number of kindlings was influenced by the diet used during the lactation period. Reproductive activity was, on average, shorter for does fed E + F diet (double cribs) than does fed the other diet, because many does consumed more E diet with an insufficient ADF content, inducing enteric troubles. Among the responsible causes for the does exclusion from the experiment, enteric troubles represented 80%, in the F + E diet, and only 15%, in the L diet. During the first 21 days of lactation does consumed 61.2 % of E diet, 38.8% of F diet and therefore the total CF and ADF contents were respectively 14.6% and 18.4% DM. The weekly control of feed consumption highlighted the variability among the does. During the first, second and third weeks the consumption of F diet was moderate and decreasing (in the first week 46.5 ± 21.3 ; in the second 33.6 ± 16.2 and in the third one 30.4 ± 13.2 respectively). It is important to say that the does which preferred the E diet continued to consume it also when the energetic requirements were low.

Does fed the F diet during the growing period showed higher feed consumption (119.1 vs 110.3 g/d/kg LW^{0.75}; $P < 0.01$), energy intake (1.26 vs 1.17) and digestible proteins intake (14.56 vs 13.57 g/d/kg LW^{0.75}) during the lactation period (PARIGI-BINI *et al.*, 1995).

The two different diets use (F and E diet) during the lactation period showed a lower feed intake (111.3 vs 117.1

Table 2 : Apparent digestibility percentage (%) of diets

	Diets			
	T	F	E	L
Dry matter	57.9 ± 0.8	53.7 ± 0.8	75.4 ± 0.9	60.5 ± 0.7
Organic matter	59.8 ± 0.9	55.3 ± 0.8	76.1 ± 0.9	61.9 ± 0.8
Crude protein	70.2 ± 1.0	67.2 ± 0.9	78.2 ± 1.0	69.6 ± 0.8
Ether extract	66.9 ± 1.3	60.4 ± 1.1	88.3 ± 1.4	60.2 ± 1.1
Crude fibre	20.4 ± 1.2	28.4 ± 1.0	20.6 ± 1.3	22.1 ± 0.9
NDF	29.2 ± 1.4	34.0 ± 1.2	24.6 ± 1.5	27.5 ± 1.3
ADF	17.5 ± 1.5	23.2 ± 1.4	17.2 ± 1.6	19.1 ± 1.3
Cellulose	23.7 ± 1.3	29.8 ± 1.2	22.0 ± 1.3	24.3 ± 1.1
Hemicelluloses	40.7 ± 1.6	44.8 ± 1.3	37.4 ± 1.4	41.3 ± 1.3
Gross energy	59.7 ± 0.8	55.1 ± 0.9	75.6 ± 0.9	61.7 ± 0.8

Table 3 : Does and pups performance with different diets.

Traits		Growing feed		Lactation feed		Parity		Error mean square
		F	T	L	F + E	Primip.	Multip.	
Kindling	n.	198	201	232	167	100	299	
Conception rate	%	76.4	75.8	76.9	74.8	77.1	75.7	215
Rabbits born alive/litter	n.	8.68	8.41	8.65	8.40	8.00B	8.72A	2.15
Rabbits weaned/litter	n.	8.04A	7.69B	7.91	7.79	7.44B	8.00A	1.90
Litter weight:								
1 d	g	502.8A	481.2B	495.2	487.4	480.0b	495.9a	5121
21 d	"	2685A	2584B	2588B	2698A	2512B	2675A	116200
35 d	"	7421A	6896B	7038B	7321A	6620B	7336A	621241
Individual weight at 35 d	"	923.7A	898.1B	890.6B	937.5A	899.0B	917.2A	4963
Feed intake (1-21 d)	MJ/d/kg LW ^{0.75}	119.1A	110.3B	117.1A	111.3B	111.0B	115.8A	131.3
DP intake (1-21 d)	"	14.56A	13.57B	13.31B	15.08A	13.66B	14.20A	2.45
DE intake (1-21 d)	MJ/d/kg LW ^{0.75}	1.26A	1.17B	1.19B	1.25A	1.18B	1.23A	0.02
Feed conversion	Feed intake/ litter weight	2.64a	2.53b	2.66A	2.48B	2.61	2.56	5395
Metabolic average weight of doe	kg ^{0.75}	2.83	2.82	2.80	2.85	2.81	2.82	0.06

A,B: P < 0.01; a,b: P < 0.05.

g/d/kg LW^{0.75}) but for a highest consumption of E diet energy intake (MJ 1.25 vs 1.19/ kg LW^{0.75}) and digestible proteins intake (15.08 vs 13.31 g/d/kg LW^{0.75}) were significantly higher (P < 0.01).

Good performances of the litter at 21 days and a small feed consumption of the does of this group showed a significant low feed conversion. Besides post-weaning diets influenced the conversion feed, that was most favourable in the T group (2.53 vs 2.64; P < 0.05).

These variability factors did not influence the conception rate that was evident on the available data (table 1). Number of rabbits birth alive/kindlings was greatly influenced by parity (8.00 for primiparous vs 8.72 for multiparous, P < 0.01) while the number of weaned rabbits/kindling was influenced not only by parity but by the diet used in the post-weaning period. The does fed F diet weaned more rabbits than the does fed T diet (8.04 vs 7.69). In the F diet group the weight of litter at birth was higher than in the other groups, probably due to number of the litter. The difference between weights of the primiparous litter and the multiparous one was of only 15 g (P < 0.05).

Weights of the litter at 21 and 35 days were influenced by the examined factors. Until 3 weeks the young rabbits increasing weight is influenced by milk production which is in relation to the available energy and proteins in the does diets (MAERTENS and DE GROOTE, 1988; SANCHEZ *et al.*, 1985). In this study the litter weight differences were not high among F and T groups (2685 g vs 2584 g) and among L and F+E groups (2588 g vs 2698 g) in contrast with the different intake expectations of DE and DP. Though the experiment didn't forecast the chemical composition of the slaughtered animals good performance production of T and L group does, was probably due to a better use of the body supply.

At 35 days the litter and the individual rabbit weight was higher in the E, E+F and multiparous groups compared to the T, L and primiparous groups, respectively.

In conclusion the use of fibrous diet in the 50 days-1st pregnancy increased the consumption of the does in the following lactations. For this reason the does that intook higher quantities of DE and DP weaned litters that were more numerous and heavier.

Simultaneous distribution of two foods, different in chemical composition and energetic density, had influenced positively litter weight at 21 and 35 days, food conversion index, DE and DP intake. However the high morbidity of the does of this group indicates that to use this type of feeding is at least undesirable as shown in this study. For this reason we suggest undergoing other studies, before rejecting this method. Probably the use of a diet with less nutritive value differences (e.g. 13.0 and 11.0 MJ/kg DM) could suggest completely different conclusions.

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