REPRODUCTION AND MORBIDITY OF RABBIT DOES EFFECTS OF DIET ENERGY LEVEL AND ORIGIN. FIRST RESULTS

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INTRODUCTION

Despite the possibility of a lactating rabbit does to intake large amounts of pelleted diet in order to obtain day after day the digestible energy needed for milk production (LEBAS, 1984, 1987), mainy fatal accidents during the reproduction are attributed to an energy metabolism disturbance probably related to a too low energy concentration of the diets (JOUGLAR, 1983). In practice, a reduction of energy concentration in a diet is usually obtained through replacement, in the diet's formula, of an energetic product such a cereal by a fibrous material such as straw. This method is efficient from the energetic point of view, but the part of digestible energy in form of glucose is reduced and the part in form of volatil fatty acids (VFA) is increased. This is not equivalent for milk production because acetate rather than glucose is the main precursor for milk fat synthesis (JONES and PARKER, 1977).

Then, the purpose of our experience is to study, during 5 consecutive litters, the effect of 2 levels of digestible energy (medium and low) and, for the medium level 2 sources of digestible energy : one (barley) giving glucose after digestion and the second (beet pulp) giving a greater part as VFA.

MATERIAL AND METHODS

The composition of the 3 experimental diets was calculated with about 75 % of common part (table 1) ; the "barley" diet (B) contents 25 % of barley ; in the "beet pulp" diet (P), barley was replaced by 23 % of beet pulp and small quantities of wheat and soya meal ; in the "straw" diet (S), barley was replaced by 20.5 % wheat straw and soya meal in order to maintain the diets isonitrogenous. From barley to straw diet the crude fiber level increases from 14.5 to 22.9 % DM.

An in vivo digestibility determination of the 3 diets was done with 6 growing rabbit/diet. The result of this estimation is on table 2. For the "beet pulp" diet, the energy concentration was not strictly equivalent to that of the "barley" diet, but the difference remains moderate (100 kcal). For the "straw" diet, the digestible energy concentration was effectively reduced : 2277 kcal vs 2632 kcal/kg on average for the 2 others. The better nitrogen digestibility in S diet, is to be related with the higher proportion of soya meal in the formula.

TABLE 1
Composition of the 3 experimental diets

Name of the diet	B "Barley"	P "Beet pulp"	S "Straw"
Formula			
- Barley	25	-	-
- Beet pulp	-	23	-
- Wheat straw	-	-	20.5
- Wheat	15.6	16.1	15.8
- Alfalfa	40	40	40
- Soya meal	13	15	17.5
- Molasses	3	3	3
- Minerals and vitamins	2.1	2.1	2.1
- Dicalcium phosphate	0.6	0.8	0.8
- Calcium carbonate	0.7	-	0.3
Composition (% DM)			
- Dry matter	89.7	89.8	89.1
- Proteins	18.1	18.8	18.8
- Minerals	10.7	9.5	10.4
- Crude fiber	14.5	18.6	22.9
- NDF Van Soest	31.8	40.0	43.9
- ADF Van Soest	15.9	20.2	25.1
- Lignine Van Soest	3.5	3.8	4.7
- Calcium (1)	1.29	1.29	1.28
- Phosphorus (1)	0.61	0.60	0.61

(1) calculated

TABLE 2
Digestibility coefficients observed with growing rabbits for the 3 experimental diets, and digestible energy concentration of the diets

DIETS	Barley B	Beet pulp P	Straw S	CV % (1)	Statistical significance
Nutrients					
- Dry matter	64.5	62.1	54.5	3.2	$P < 0.001$
- Organic matter	64.0	62.9	55.0	4.3	$P < 0.001$
- Energy	63.3	60.9	53.5	4.2	$P < 0.001$
- Nitrogen	71.6	70.0	75.5	2.9	$P < 0.01$
- Crude fiber	1.6	17.0	12.8	-	- (2)
- Digestible energy (kcal/kg DM)	2684	2582	2277	-	-

(1) CV % : residual coefficient of variation
(2) Only one pooled sample per diet.

222 NewZealand White females(line INRA 9077) were divided into 3 homogenous groups. They were fed ad libitum one of the 3 diets from the first presentation to a male (123 days old) until the weaning of the 5th litter. The general scheme of production (mating 10 days after kindling and weaning at 28 days) was described previously (COUDERT and LEBAS, 1985). During the experiment a female was eliminated only after 3 sterile matings or for illness.

Experimental data were analysed according to variance analysis for unbalanced groups and according to proportions comparison method of chi-square of Pearson.

RESULTS

From the 222 experimental does, 91 % become pregnant at least one time, without difference between diets : 67 to 68 does/group (table 3). The evolution of the number of does is similar for the 3 groups during the production period. The only difference is a significantly greater proportion of death in B group than in the 2 others ; but the final number of alive does is not different. It is possible to consider that the "health problems" of P and S does are not so acute than in the B group and then these does are eliminated before a sudden death. Effectively, does eliminated for illness are 1 - 6 and 8 in the B, P and S groups respectively.

TABLE 3
Evolution of rabbit does number in each group during the experiment (until 5th litter)

Groups	B	P	S
- Initial number of does	74	74	74
- Eliminated before 1st pregnancy (1)	7	6	7
- Productive does :			
. total number	67	68	67
. Eliminated	10	22	22
. Dead	34	26	20
. Alive at the end	23	20	23

(1) dead or alive but never detected pregnant

The productivity at birth is not different between the 3 groups for number of litters, young per litter, as for weights at birth (table 4). On the other hand, mortality between birth and weaning is significantly ($P < 0.001$) greater in the B group than in the 2 others. One part of this mortality corresponds to the whole litter death : 16 % of B litters and only 9 % for P and S litters ($P < 0.05$). But in litters with 1 young weaned at least, mortality 0-28 days is significantly ($P = 0.06$) greater for B and P groups (15.8 % on average) than for S group (13.6 %). So, it is possible to classify the groups, for mortality 0-28 days, as follows : B > P > S.Weights at weaning are not different between groups and also does weight is similar in each experimental group (table 4).

TABLE 4
Productivity of does calculated per litter

Groups	B	P	S	Variance analysis (F)	
- Total litters with 1 born alive or more	194	186	210		
- Mating/kindling	1.76	1.81	1.94	1.5	NS
- Nb still born/litter	0.57	0.34	0.44	1.16	NS
- Nb born alive/litter	7.70	7.80	7.70	< 1	NS
- Litter weight at birth (g)	423	439	430	< 1	NS
- Individual weight at birth (g)	58.0	58.3	58.3	< 1	NS
- Total number of weanings (n ≥ 1)	163	167	191	-	
- Litters lost before weaning	31	19	19	-	
- Nb weaned/kindling	5.60	6.01	6.12	1.24	NS
- Nb weaned/weaning	6.66	6.69	6.73	< 1	NS
- Nb dead 0-28 d/kindling	2.10	1.79	1.58	2.98	P<0.05
- Litter weight at weaning (g)	3617	3641	3643	< 1	NS
- Individual weight at weaning (g)	577	563	565	< 1	NS
- Does weight 7 days after kindling (g)	3781	3726	3697	1.3	NS

DISCUSSION

As in our previous experiments (LEBAS, 1984), rabbit does have been able to produce the same number of litters and youngs at birth with diets differing widely in digestible energy concentration. The additionnal result of the present study is a possible lower production at weaning with the barley (starch) diet, mainly because of whole litter death. One part of this difference is the consequence of mother death in B group greater than in the P group however not really different from the energetic point of view (2680-2580 kcal ED/kg). This relation between mother and litter mortality has been described previously by some of us (COUDERT et al., 1983). Then, after this first analysis of results we have to follow up the analysis of data to precise the exact moment of does death in the B groups and pathological motivations of illness elimination (all does were killed after elimination and necropsied). A new experiment with more prolific rabbit strain may be of some interest because of the possible relation between number (excess) of young in the litter and mother death 10-15 days after kindling (JOUGLAR and LEBAS, 1986).

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Three groups of 74 NewZealand White does received ad libitum from the first mating to the weaning of the 5th litter one of the 3 following diets different in the energy source and amount : B barley 2680 kcal ED/kg - P beet pulp 2580 kcal - S straw 2280 kcal. Numbers of productive does (67 - 68 out of 74) and total litters obtained (B: 194 - P: 186 - S : 210) are not significantly different. But greater does mortality (51 % of productive does) and young mortality between 0 and 28 days (27.3 %) were observed in the B group than in the 2 others (34 % and 21.9 % respectively). There is no difference between groups in number of young born alive (B: 7.70 - P: 7.80 - S: 7.70) or dead born per litter. Before any conclusion datas must be analysed more precisely mainly in chronology of death, and a repetition of this experiment must be conducted.

PRODUCTION ET MORBIDITE CHEZ LA LAPINE : EFFETS DU TAUX ET DE LA SOURCE D'ENERGIE ALIMENTAIRE PREMIERS RESULTATS

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Trois groupes de 74 lapines Néozélandaises blanches ont reçu à volonté, à partir de la première saillie et jusqu'au sevrage de la 5ème portée, l'un des trois aliments suivants, différant par le taux et l'origine de l'énergie digestible : B orge 2680 kcal ED/kg - P pulpes de betteraves 2580 kcal et S paille 2280 kcal.

Le nombre de lapines productives (67 à 68/74 par lot) ainsi que le nombre total de portée par groupe (B: 194 - P: 186 - S: 210) ne diffèrent pas en fonction de l'alimentation. Par contre, avec l'aliment B à base d'orge, la mortalité des lapines (51 % des lapines productives) et la mortalité 0-28 jours des lapereaux (27.3 %) sont significativement plus grandes que celles observées pour les deux autres aliments (34 % et 21,9 % respectivement). Il n'y a pas de différence entre groupes pour le nombre de lapereaux nés vivants par portée (B: 7,70 - P: 7,80 - S: 7,70) ou pour celui des morts nés. Avant toute conclusion, il conviendra d'analyser plus finement les résultats, en particulier les chronologies de mortalité, et aussi il sera utile d'effectuer une répétition de l'expérience.