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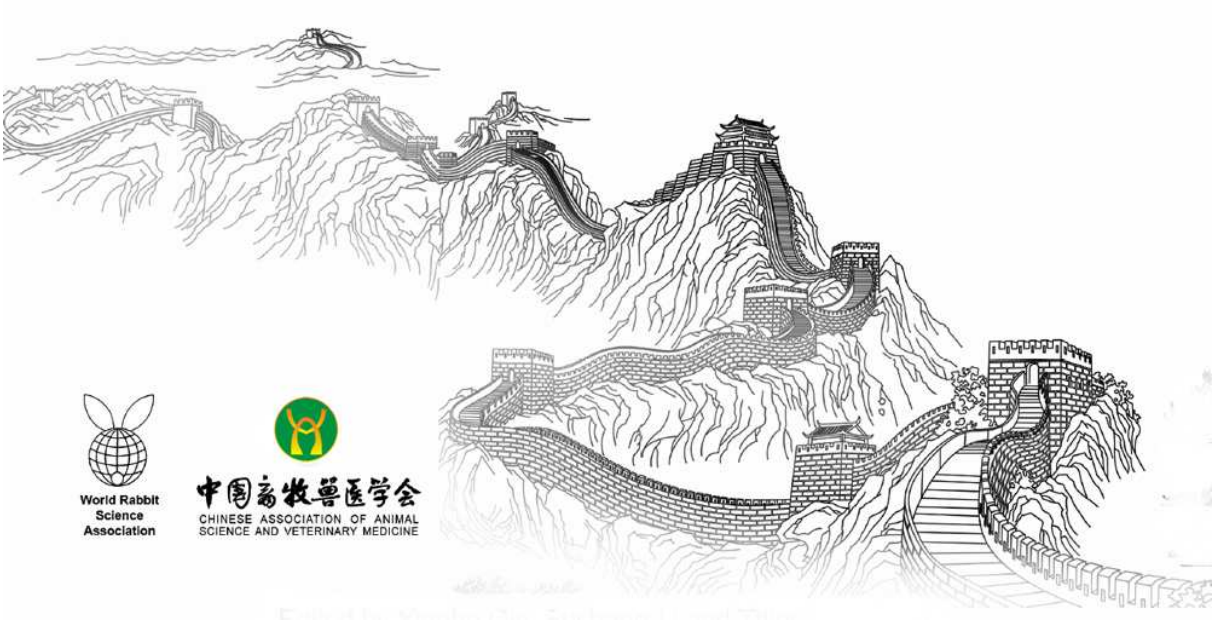

EFFECT OF A LOW ENERGY FEED GIVEN AD LIBITUM ON PREPARATION OF YOUNG RABBIT FEMALES FOR THEIR REPRODUCTIVE CAREER- PRELIMINARY RESULTS

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ABSTRACT

A trial was conducted during two years comparing two ways of raising young rabbit females between 10 weeks old and 24 weeks old (first parturition). The trial was performed on two successive periods: a first one, with 5 batches of young females (total of 207 animals, inseminated the first time between March and August, 2014) fed a "maternity" feed (group MF1, 2465 kcal DE/kg, 17.2% crude protein, and restricted at 135 g/d/rab.), and a second one with 6 batches of young females (253 does, inseminated between November 2014 and June 2015) fed with a low energy and protein feed (group LF2, 1575 kcal DE/kg, 13.0% crude protein) given *ad libitum*. The parturition rate was higher in LF2 group (*ad lib.*) compared to MF1 (85.7 *vs.* 75.8%; P<0.01), as well as the persistence rate (47.2 *vs.* 32.4% at the ninth insemination; P<0.01) and the viability of the does (42.0% *vs.* 17.3% on the ninth first cycles, P<0.01), without significant differences for prolificacy.

Key words: Young rabbit female, low energy feed, *ad libitum* feeding, reproduction performance

INTRODUCTION

To get good results in maternity and fattening of rabbits in commercial production, livestock renewal has to be regular in every cycle. For this, farmers breed young females to inseminate them between 16 and 19 weeks old. These females are generally raised with fattening rabbits between weaning and 10 weeks old, and from 10 weeks to first artificial insemination (AI) are generally fed with maternity or fattening feed, with restricted quantity of feed (during most of the period, 135 to 150 g/d/rab.).
However specific feeds for young females were also developed, with low energy level that can permit to give feed *ad libitum*, without having too heavy animals and having good results in the same time. Verdelhan *et al.* (2003) showed that it is possible to control the weight at 19 weeks of young females when they are fed with a pelleted feed having a low concentration of digestible energy (DE : 1550 kcal DE /kg feed) and given *ad libitum*. After three weeks of adaptation, does regulate their feed consumption on energy level of the diet. According to Verdelhan *et al.* (2005), this type of practice can improve parturition rate.
The aim of this study is to investigate if specific feed for young females (low in energy and protein, high in crude fibre) given *ad libitum*, could permit to decrease does mortality during their career (Lowe,1996), avoiding digestive problems thanks to a better preparation, with a digestive tract enlarged and used to digest important quantities of feed.

MATERIALS AND METHODS

Animals and experimental design

The study was conducted in two successive periods, in a commercial farm in Normandy (Western France), where 30 to 50 primiparous does (Hyla lines) entered the livestock every six weeks. The farm was conducted in single batch with 42 days between two inseminations. A first experimental group,

MF1, was composed of 5 batches of young females (total of 207 animals), fed with 135 g/doe/day of a maternity diet, from 10 weeks old to 7 days before first parturition (move to the cleaned stable)(see Table 1 for composition). First batch was inseminated the first time the 7th of March, 2014 and the fifth the 22th of August, 2014 (June, 12th, 2015 and November, 27th, 2015 for the twelfth AI Respectively). A second experimental group, LF2, was composed of 6 batches of young females (total of 253 animals), fed *ad libitum* with a low energy diet. From 7 days before the first parturition, animals of both groups were fed with maternity feed ad libitum. First batch was inseminated the first time the 14th of November, 2014 and the sixth the 12th of June, 2015 (tenth and fifth AI the 27th of November, 2015, respectively). Because of the following periods of this preliminary trial, it is important to notice that diet effect and period effect are not independently assessed. A further study will be conducted to compare the two feeding strategy during the same period.

All reproductive data per doe were registered by MiXscience software Eliott. Studied variables were prolificacy, fertility (parturition rate), persistence and mortality of does. From second parturition stage, prolificacy and fertility were studied only on does always pregnant on previous parturitions.
Persistence rate (percentage of females still in production) was compared with recommendations from Hyla technical handbook. Mortality rate is calculated on number of females present at first AI.
Animals were housed in individual cages at the age of 11 weeks old. After parturition, nine young rabbits were left in the nests for does of row 1and 2, and ten for multiparous.

Table 1: Average feed composition

Ingredients (%)	**MF**	**LF**
Cereals	12.9	3.8
Cereal byproducts	35.0	13.4
Meals (sunflower, rapeseed)	25.1	20.0
Mustard bran	5.0	
Beet pulp	7.2	
Molasse, water	3.5	3.5
Minerals, amino acids, premix	2.0	6.5
Alfalfa	8	8
Lignin raw material	1.3	44.9
Chemical composition % *		
Humidity	11.6	10.2
Digestible Energy (kcal DE /kg)*	2465	1575
Enzymatic starch	13.3	5
Lipid	3	3.6
Crude protein	17.4	13.0
Crude fiber	14.1	27.8
NDF (neutral detergent fiber)	33.3	47.3
ADF (acid detergent fiber)	17.7	35.8
ADL (acid detergent lignin)	5.3	12.1

* values are calculated according to table of ingredients.

Composition and chemical analyses of the diets
All the feeds used did not contain antibiotics, only a coccidiostatic (robenidine at 66 mg/kg of feed). Premix used was a specific maternity one. Chemical composition was calculated thanks to MiXscience matrix of raw material. Digestible energy (DE) was calculated according to MiXsciences tables of ingredients.

Statistical Analysis
Statistical analysis was realized with SPSS software (released 2009, version 18.0). A general linear model univariate was used for study of prolificacy. Kits survival rate at birth was analyzed with a Mann-Whitney test. Does mortality, persistence rate and parturition rate were analyzed with a Khi2 test.

RESULTS AND DISCUSSION

First of all, let us recall that our preliminary trial was conducted on two successive periods for MF and LF feeds, that cannot allow us to attribute the effects only to the feeding strategy.

Fertility and prolificacy

Fertility and prolificacy were studied by batch (each group of 40 young females) during the four first AI and parturition. Only the average data was presented per experimental group. Results were presented by parity order (table 2).

Table 2: Fertility and prolificacy on the four first parturitions

Parturition stage	1			2			3			4		
Group	MF1	LF2	Prob.	MF1	LF2	Prob.	MF1	LF2	Prob.	MF1	LF2	Prob.
Nb of inseminated animals	216	261		193	228		146	169		124	113	
Nb of does with a litter	184	249		123	174		110	135		98	104	
Fertility (%)	85.2 [a]	95.4 [b]	<0.01	63.7 [a]	76.3 [b]	<0.01	75.3	79.9	0.33	79.0 [a]	92.0 [b]	<0.01
Total kits born	10.6	11.1	0.11	11.4	11.1	0.41	11.2	11.4	0.76	11.5	11.5	0.88
Total kits born alive	8.6	8.9	0.33	9.6	9.8	0.58	9.8	10.1	0.53	10.3	10.2	0.92
Viability rate (%)	81.0	80.7	0.25	84.1 [a]	88.5 [b]	0.02	86.8	88.5	0.27	89.7	88.7	0.33

Means with different letters differ significantly (see different tests described in materials and methods).

A significant improvement of the parturition rate was observed for the first, second and fourth parturition, for the group LF2. This was consistent with observations of Verdelhan *et al.* (2005). We can suppose that a low energy feed fed ad libitum would lead to have females with less body stocks in adipose tissues, and then would permit better chances of success at insemination.
Kits survival rate at birth (total kits born alive / total kits born) was significantly higher for LF2 group in the second parturition, maybe thanks to a better health of females or induced by the period.

Table 3: **Persistence rate and does mortality**

Parturition stage	Nb of batches		Nb of inseminated animals		Nb of dead does		Persistence (%)			Mortality rate (%)		
	MF1	LF2	MF1	LF2	MF1	LF2	MF1	LF2	Prob.	MF1	LF2	Prob.
1	5	6	216	261	10	8	100	100		4.6	3.1	0.37
2	5	6	199	251	38	13	92.1	96.2	0.06	17.6 [a]	5.0 [b]	<0.01
3	5	6	148	222	16	6	68.5 [a]	85.1 [b]	<0.01	7.4 [a]	2.3 [b]	<0.01
4	5	6	133	203	8	7	61.6 [a]	77.8 [b]	<0.01	3.7	3.3	0.52
5	5	6	109	181	5	4	50.5 [a]	69.4 [b]	<0.01	2.3	2.3	0.53
6	5	5	98	158	3	4	45.4 [a]	60.4 [b]	<0.01	1.4	2.3	0.73
7	5	4	86	123	4	4	39.8 [a]	58.8 [b]	<0.01	1.9	3.1	0.81
8	5	3	76	95	2	2	35.2 [a]	51.5 [b]	<0.01	0.9	1.6	0.62
9	5	2	69	60	1	2	31.9	42.3	0.10	0.5	2.7	0.11
10	5	1	63	28	1		29.2	39.5	0.20	0.5		
11	5		57		3		26.4			1.4		
12	5		46		1		21.3			0.5		

Means with different letters differ significantly (Khi2 test).

Persistence rate and does mortality

The persistence rate of MF1 group was lower than theoretical recommendations from the second AI, and lower ($p<0.01$) than LF2 group until AI9 (Table 3, Figure 1). At AI10, data for LF2 group were based on only 2 batches (the 2 oldest batches) because the results of latter parturition were not yet available, this explained why the comparison with MF1 group was not significant. After the eighth AI, decreasing of MF1 curve was less important than theoretical curve.
With LF2 group, the persistency curve was following theoretical curve (even higher). This was interesting because that permitted to do a better selection on technical criteria to have better results and respect the theoretical ages pyramid. This was possible thanks to a lower mortality rate in LF2 group to MF1 group on cycle 2 and 3 ($p=<0.01$, Table 3). The lower mortality rate explained also a part of the improvement of the parturition rate.

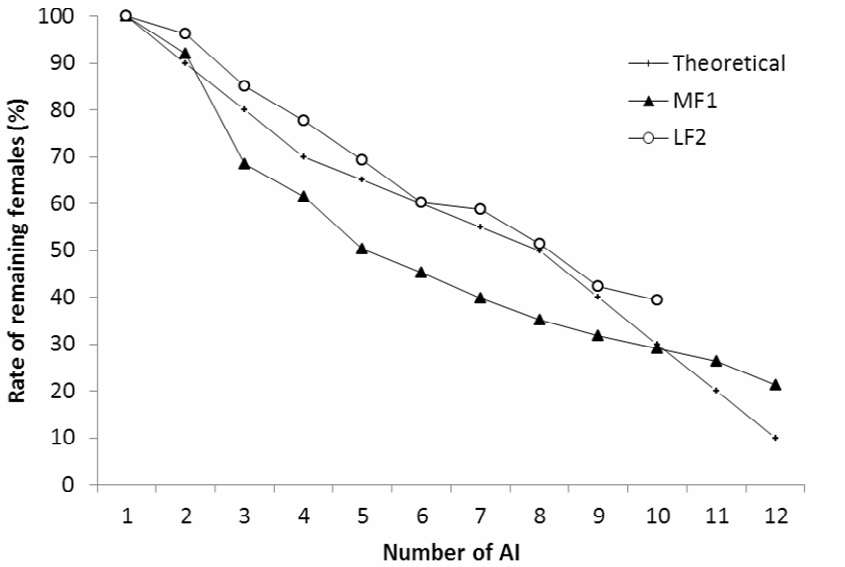

Figure 1: Evolution of persistence rate between first and twelfth AI

CONCLUSIONS

The mortality of does on the second and third AI was lower (17.6 and 7.4% *vs.* 5.0 and 2.3% respectively, $p<0.01$), with a low energy and protein diet fed *ad libitum* in period 2 (group LF2). Similarly, the persistence rate of does (51.5% *vs.* 35.2% at the eighth insemination, $p<0.01$) was higher for LF2 group, as well as the fertility (85.7% *vs.* 75.8%, $p<0.01$). These preliminary results must be confirmed with another study to separate the effect of the period (season) and that of feed strategy. Such strategy may help to reduce mortality, and thus antibiotic use.

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Effect of a low energy feed given *ad libitum* on preparation of young rabbit females for their reproductive career

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- Livestock renewal is essential to maintain high maternity performances
- For the expression of the high potential of animals, it is important to manage the amount of nutrients given to young females

1 Target

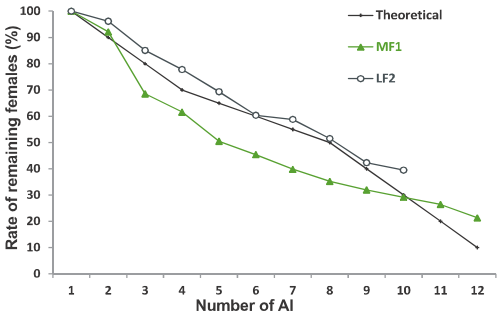
- Use of a specific feed (low in energy and protein, high in crude fiber) given *ad libitum* in order to:
  - Decrease mortality of young females
  - Improve farrowing rate
  - Save work time to the farmer, without control of feed quantity given

2 Materials and methods

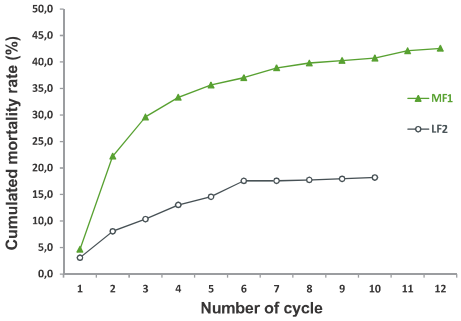
- Trial realized from March, 2014 to November, 2015 in the west of France
- Hyla genetic
- Group MF1: first period, 5 batches (1 peach 6 weeks) fed with 135 g/d of maternity feed (2465 kcal, 17.2% raw protein)
- Group LF2: second period, 6 batches fed *ad libitum* (1575 kcal, 13.0% raw protein)
- Different feeding from 10 weeks old to 7 days before 1st farrowing

3 Results

Evolution of persistence rate between 1st and 12th AI

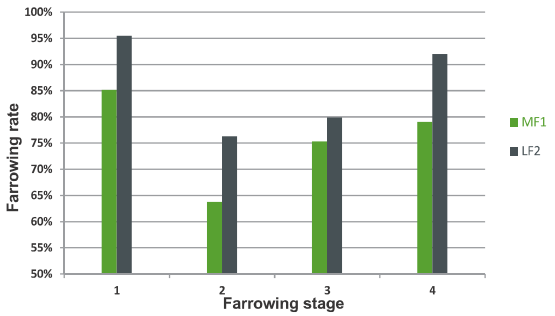


Evolution of does losses



- Due to lower losses of does, there is better persistence rate (51.5% vs. 35.2% at the 8th AI, p<0.01) in accordance with genetic recommendations

Parturition rate from the 1st to 4th farrowing stage



- Average farrowing rate is significantly improved from 75.8% to 85.7%

4 Conclusion

Using a low energy and protein feed given *ad libitum* allowed to:

- Decrease mortality of does on second and third AI (17.6 and 7.4% vs. 5.0 and 2.3% respectively, p<0.01) and then improve persistence rate
- Improve farrowing rate (85.7% vs. 75.8%, p<0.01)
- Potentially decrease medication