

EFFECT OF PROTEIN LEVEL ON LACTATING PERFORMANCE, DAILY GAIN AND FUR DENSITY IN REX RABBIT

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ABSTRACT

Forty-five synchronous lactating rabbits and sixty 30-days old weaned Rex rabbits were distributed into three groups at random. Three diets with three different protein levels (17.5%, 16% and 14.5%) were fed respectively. The weight gain, lactating performance and fur density were tested. The weaning weight, litter weight and survival rate at weaning of young rabbit fed with high, middle, low protein was 450.4g, 429.0g, 389.2g; 3213g, 2946g, 2517g; 95.5%, 92.0%, 86.6%, respectively. The weaning survival rate of middle protein group was not higher than in the low one while weaning weight and litter weight were improved greatly ($p < 0.05$). Thus the protein level in lactating rabbits should be above 17.5%. The growing Rex rabbit gained rapidly with increasing protein levels. Gain of low group was significantly reduced than the high ($p < 0.01$) and the middle ($p < 0.05$) at 3, 4 and 5 month period. The skin area at five months old fed with the high and middle protein diet reaches the standard of first class. Fur density showed the same regularity as body development. The peak of weight gain and fur density occurred during 2 and 3 month of age for Rex rabbits. The rabbits fed with a high protein diet have the highest weight and the largest fur density. In Rex rabbit, there was a superposition in hair follicle differentiation and gain of growing animal.

Key words: Rex rabbit, lactating performance, weaning survival rate, weaning weight, daily weight gain, fur density, fur area, protein requirement.

INTRODUCTION

The Rex rabbit is a typical breed for fur production and fur density is an important component of the quality. The growing rate is limited by a lot of factors such as breed, climate, management, nutrition, disease, etc, among them nutrition is very important, specially protein level in diet. This work was designed to study the relations between

protein level in the diet and lactating performances, weight gain and fur density.

MATERIAL AND METHODS

Nutrient level and diet composition

Three rations with different protein levels were designed. The ratio of lysine to protein is 1:22.5, and to sulfur amino acid is 1:0.7.

Table 1. Diet Composition and Nutrient Level (%)

Ingredient	Protein levels			Remark
	High (17.5%)	Middle (16.0%)	Low (14.5%)	
Corn	26.55	28.33	31.93	1 The premix1 is anti-coccidiosis medicine mixture. 2 Premix2 is composed of vitamin and minerals.
Wheat bran	25.71	25.62	28.40	
Soybean meal	17.72	14.25	8.65	
Cotton seed	6.00	5.00	6.00	
Soybean	15.34	12.33	14.48	
Peanut vine	5.65	11.54	7.44	
Limstone	1.68	1.60	1.71	
Salt	0.50	0.50	0.50	
Lysine	0.001	0.01	0.058	
Methionine	0.104	0.07	0.087	
Premix1	0.25	0.25	0.25	
Premix2	0.50	0.50	0.50	
Nutrient Content				
DE (M J/kg)	10.46	10.46	10.46	
CP (%)	17.5	16.00	14.50	
Ca(%)	0.90	0.90	0.90	
P(%)	0.50	0.50	0.50	
Lys(%)	0.79	0.72	0.65	
Met + Cys(%)	0.55	0.50	0.46	
CF(%)	12.00	12.00	12.00	

Animal

45 American breed rabbits which have synchronously kidded were allotted randomly in three groups according to foetus numbers (112 kids in each group). The different diets were fed to each group from birth to the weaning (30-days old).

60 American breed does after weaning were selected and allotted in three groups at random, with 20 does in each group. Diets with different protein content (PC) were fed. The weight and fur density were measured in the morning before feeding once a month.

Management and data analysis

The young and the nursing rabbits were fed in the same cage. The growing rabbits were fed in small collective cage. Before trial all the rabbits had been injected vaccine and an anti- coccidiosis drug was mixed into the ration. The lactating trial was from April 20 to May 20 in 2000 and the growing experiment lasted 130 days from April 13.

Data was analyzed by Duncan' method.

RESULT

Effects of Different Protein Level on Lactating Performance

Table 2. Effects of Different Protein Level on Lactating Performances (mean \pm S.D.).

Group	Number of nursing does	Number of young rabbits	Litter weight at birth (g)	Number of weaned rabbits	Weaning survival Rate (%)	Weaning litter weight (g)	Average weaning weight (g)
High	15	112	459 ± 61.9	107	95.54 ^a	3212.9 $\pm 323.7^a$	450.41 $\pm 44.4^a$
Middle	15	112	455 ± 65.3	103	91.96 ^{ab}	2946.1 $\pm 340.2^{ab}$	429.03 $\pm 49.6^{ab}$
Low	15	112	457 ± 72.6	97	86.61 ^b	2517.0 $\pm 311.4^c$	389.22 $\pm 48.2^c$

Figures followed by different letters are significantly different ($P < 0.05$ or $P < 0.01$).

Data in table 2 showed that significant differences occurred on lactating performances according to PC levels. The weaning weight and survival rate at weaning of high protein group were significantly higher ($p < 0.05$, or $p < 0.01$) than those of the low one, but not significant than the middle one, which demonstrated the better lactation ability of the high PC group. None obvious differences in weaning survival rate were found between the middle and the low groups ($p > 0.05$), while the individual weight and litter weight at weaning of the middle group were significantly higher ($p < 0.05$) than the low one.

Effect of different protein level on live body weight of the growing rabbits

The live body weight of animals fed with a high protein diet was significantly higher than the low one ($p < 0.05$). The middle group was significantly higher ($p < 0.05$) than the low protein group, but no difference was found between the high and the middle.

Table 3. Effect of different protein levels on live body weight (mean \pm S.D.) of the growing rabbits

Month age	Live body weight (g)		
	High	Middle	Low
1	453.4 \pm 44.6	450.7 \pm 46.2	452.8 \pm 43.8
2	1029.1 \pm 82.5 ^a	995.2 \pm 84.2 ^a	915.4 \pm 73.6 ^b
3	1788.2 \pm 125.0 ^a	1655.3 \pm 131.5 ^{ab}	1406.6 \pm 139.7 ^c
4	2358.4 \pm 138.9 ^a	2163.4 \pm 146.2 ^{ab}	1799.2 \pm 141.4 ^c
5	2718.5 \pm 146.0 ^a	2514.4 \pm 137.4 ^{ab}	2218.4 \pm 149.3 ^c

Figures followed by different letters are significantly different ($P < 0.05$ or $P < 0.01$).

Effect of different protein levels on fur density of the growing rabbits

Table 4. Effect of different protein levels on fur density (mean \pm S.D.).

Month age	Fur density (number/cm ²)		
	High	Middle	Low
1	6125 \pm 655	6133 \pm 637	6129 \pm 661
2	7974 \pm 689 ^a	7243 \pm 676 ^{ab}	6388 \pm 694 ^b
3	11522 \pm 1044 ^a	10037 \pm 1028 ^b	8493 \pm 1069 ^c
4	12866 \pm 1076 ^a	11122 \pm 1117 ^b	9320 \pm 1083 ^c
5	13983 \pm 1152 ^a	12455 \pm 1139 ^{ab}	10658 \pm 1064 ^c

Figures followed by different letters are significantly different ($P < 0.05$ or $P < 0.01$).

Data showed that fur density is affected by diet protein level. There were significant differences between the high protein group and the middle one at 3 months old ($p < 0.05$). The fur density was thicker in the high PC group than in the low one at 2 months old ($p < 0.05$), and high significantly thicker at 3, 4 and 5 months old ($p < 0.01$).

DISCUSSION

Nutrient Requirement

At present there is no uniform standard on Rex rabbit nutrient requirement, so people

often refer to NRC (1977) and LEBAS (1980). It is important to establish Rex rabbit nutrient requirement according to its characteristics. GU (2002) recommended protein, lysine and sulfur amino acid requirements of the growing Rex rabbit and the lactating doe. The nutritional levels of the growing and lactating does are the same in this trial and result showed that lactating performances of the doe, weaning survival rate, gain growth and fur density are improving as the protein levels are increasing.

Relationship between lactating performances and nutrition

There is positive correlation between weight gain and milk suckled by young rabbits during lactation and a positive correlation between weaning weight and weaning survival rate. The protein and essential amino acid play a key part in lactating performances. The protein requirements of the doe are 15-20% (NRC, 1994; LEBAS, 1980; DING 1989; SCHLOLAUT 1985; LIAO 1997; GU, 2002). The protein requirements of the lactating and pregnant doe are increased by 1%-2% and 2%-3% respectively. We recommend the protein level in lactating doe diet should be above 17.5%.

Relationship between daily gain and nutrition

This trial showed that growth rate of the growing rabbit increased as the protein level is increasing. The growth rate of high protein group is the best and there are obvious differences between the middle and the low ($p < 0.05$). This result is similar to those of LI (2002). The young rabbit grew fastest between 2 and 3 months of age. According to the general rule of animal development, the rate of gain is fast in the first life stage but it is low at 1-2 months old because of weaning stress. All data demonstrate that the Rex rabbit grew fastest at 3 months old. So we should provide enough protein to meet the requirement. From our trial the protein level in Rex rabbit diet should be 16%-17.5%.

Relationship between hair follicle development and nutrition

The fur density of the growing rabbit in high protein group is thicker than that of the low one. The fur density increased along with the protein level is increasing. The fastest increase of fur density is at 2-3 months old. The enhancing of fur density is based on hair follicle differentiation, which is affected by gene and environment, especially environment. The optimal stage for fur density increasing is at 3 months old, which demonstrate that nutrition is very important for the fur in early stage. The hair follicle differentiation was also affected by the protein content in early stage. So the protein level in diet should be higher in early stage, at weaning, and lower in the late stage.

Relationship between daily gain and fur density

There is a highly positive correlation between the weight gain and fur density. Body

growth and fur development are synchronous, and the peak is in the same period. So in the peak stage enough nutrient especially protein must be provided.

CONCLUSIONS

There is a direct correlation between the weaning individual weight, litter weight of the young and protein level in the diet. The diet of the female should be above 17.5%. The fur area and the weight gain of the growing rabbits was affected by protein level in diet. The peak period of daily growth gain and fur density increasing for the growing rabbits is 2-3 months old. A high protein diet (>17.5%) should be adopted in 3-3.5 months old and then a middle protein diet (>16%) in the following stage. The weight gain and fur differentiation are synchronous so high protein diet should be provided in early period.

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