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Effect of Different Levels of Protein Supplementation on Reproductive Performance of Rabbit Does Under Tropical Condition

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ABSTRACT

Reproductive performance of rabbit does was studied under different feeding regimens. The study was conducted over a 125 days period with 150 does which were randomly assigned to three treatment groups of 50 does each. The does were fed one of the diets containing 13.17, 16.64 and 21% crude protein (CP) supplementation with *ad libitum* green grass (*Hymenachne pseudointerrupta*, CP=6.6%). Gestation period, litter size and litter weight (at birth & weaning), individual pup weight at birth and weight gain up to weaning (28 d) did not differ ($P>0.05$) among the treatment groups. The pregnancy rate of does and mortality of pups up to weaning were significantly affected ($P<0.05$) among the treatment groups. Mean of the pregnancy rate was highest (100%) in group fed on 21.00% CP diet, while number of pup alive up to weaning was highest (100%) in group fed on 13.17% CP diet. Based on these findings, diet containing 21% CP along with *ad libitum* green grass may be suggested for better reproductive performance of does under tropical condition.

Key Words: Protein; Reproductive performance; Rabbit; Tropical condition

INTRODUCTION

Domestic rabbits (*Oryctolagus cuniculus)* are emerging viable livestock species which can be successfully raised on diets that are low in grain and high in roughage. They are well adapted to backyard rearing system and do not require much capital. Rabbit meat is also known as of high quality, being high in protein and low in fat and cholesterol (Handa *et al.,* 1995). Rabbits have a very high reproductive potential because of their rapid growth rate, short gestation period and ability to breed immediately after parturition. No other animal has this amazing reproductive efficiency.

Proteins are essential organic constituents of living organism. All living cells synthesize proteins for part or whole of their life. Lower dietary protein is likely to reduce the productive and reproductive performance whereas excess dietary protein would increase the production cost (Sanchez *et al.,* 1985). Less research work has been done on requirement of protein for optimal reproductive performance of rabbit under tropical condition. Therefore, a present research work has been under taken to study the effect of feeding of different levels of crude protein supplementation on reproductive performance in does.

MATERIALS AND METHODS

The experiment was conducted over a 125 days period at the Animal Nutrition Field Laboratory of Bangladesh Agricultural University, Mymensingh with 150 New Zealand White domestic does (60 bucks, for breeding purpose). The does were 12-13 months of age having an initial live weight of 2000-2300 g. The does were randomly assigned to three experimental groups of 50 each group in completely randomized design (CRD). All of the experimental animals were housed individually in steel Quonset–style cages measuring 1.95 m×1.80 m×1.27 m with a subterranean nest box (Harris *et al.,* 1982) in each, which provided natural light and ventilation. The size of each cage was about 43 cm × 20 cm × 62 cm. J-shaped screened metal feeder and 250 ml bottle waterers were provided at the front of the each cage. Close observation and careful attention were done during the experimental period to check the mortality and find out any disease problem. After 30 days of the starting of experiment, does were transferred to buck's cage for mating and kept there for 2 h and returned to its own cages. Similarly, all the does of three experimental groups were allowed for mating. After 2 days, all the does bred again randomly by different bucks. At the end of gestation period (28 d), each doe was provided one wooden nest containing straw inside.

Three experimental diets were formulated with three levels of supplemental crude protein viz. 13.17, 16.64 and 21% CP with similar level of ME (2486-2521 kcal/kg) on the basis of recommendation of NRC (1977). The ingredients and nutrient composition of the diets were calculated according to AOAC (1984) and shown in Table I. The does were fed on one of the three formulated diets

(concentrate) along with *ad libitum* green grass (*Hymenachne pseudointerrupta*, 6.6% CP). The required feed (both green grass and concentrate) was offered to all rabbits twice daily, once in the morning at 8.00 a.m. and afternoon at 3.00 p.m. Clean fresh water was made available to rabbits at all times.

Animals were weekly weighed before the morning feeding. The live weight changes and feed intake were recorded. Pregnancy rate, gestation period, litter size, litter weight, pup weight gain, pup mortality were recorded regularly. Data were analyzed using the method described by Steel and Torrie (1980). Least significant difference (LSD) was used to compare the means for different parameters. The Chi-square test was used for comparing the mortality and pregnancy rate of rabbits in different treatment groups.

Table I. Ingredient and nutrient compositions of supplemental diets

	Supplemental diets		
Ingredient	**13.17%CP**	**16.64%CP**	**21.00%CP**
Concentrate mixture (kg/100 kg):			
Maize	38.00	30.00	27.00
Wheat	28.00	18.00	10.00
Wheat bran	33.10	38.10	33.10
Til oil cake	--	9.00	9.00
Soybean meal	--	4.00	20.00
Vitamin and mineral mixture	0.25	0.25	0.25
Common salt	0.50	0.50	0.50
L- Metheonine	0.15	0.15	0.15
Nutrient composition:			
Crude protein (%)	13.17	16.64	21.00
ME (kcal/kg)*	2621	2486	2525
Calcium (%)*	0.09	0.29	0.20
Phosphorus (%)*	0.23	0.34	0.40

Source: Official Methods of Analysis. 14th Edn. Association of Official Analytical Chemists, AOAC (1984), Washington, DC
* Calculated from the manual of Selected Topics in Animal Nutrition by W. Close and K.H. Menke (1976)

RESULTS AND DISCUSSION

Reproductive performance of does fed different level of CP diet (Table II) indicate that pregnancy rate of the does was significantly ($P<0.05$) influenced by CP content of diet, it was at the maximum level in does fed diet containing 21% CP.

The average gestation period ranged from 31-32 days did not differ ($P<0.05$) among groups. An agreement with observations reveal by Omole (1982) gestation period of 31.2 days was recorded for 18% CP diet and higher value up to 33.7 days for lower 10% CP diet.

At birth, average liter size (20) and litter weight (120 g) was smaller but not significantly in the does fed 13.17% CP diet than the does fed 16.64 and 21.00% CP diet (Table II). Similar type of results was reported by Aganga *et al.* (1991) and Sanchez *et al.* (1985), they obtained maximum litter size (7.18) by using higher level of CP (21.00%) in the diet. El-Hady (2001) also reported that litter size at birth was not significantly influenced by increasing dietary protein levels up to 19%. But, Alla *et al.* (2002) observed that litter size and litter weight at birth were significantly higher ($P<0.01$) in 18% CP containing diet than 15% CP diet. However, mean pup weight was heaviest (not significantly) in does fed 13.17% CP diet than the other higher levels of CP (16.64 and 21.00%) diets. Heavier individual pup weight was found as results of smaller litter size (Lebas 1980; Yono *et al.*, 1986). Average litter size (2.0, 4.0 & 3.6) and litter weight (690, 1191 & 1164 g) at weaning, also did not affected. But another workers (Anandan & Dey, 1998) found that litter size was significantly ($P<0.01$) higher in does fed 30% CP diet than the does fed 17% CP diet. El-Hady (2001) and Alla *et al.* (2002) also reported that litter size and litter weight gain from birth to weaning were significantly higher ($P<0.01$) in 18 and 19% CP containing diets than other lower CP containing diets (such as 15 & 17%).

Individual pup weight of does fed 13.17% CP diet increased at higher rate (355 g) upto weaning (28 d) than the other does fed 16.64 and 21% CP diet (Fig. 1). Higher growth rate of pups on the low protein diet (13.17% CP) was more likely caused by the lower number of pups per litter and consequently less competition for milk resulting in heavier individual pup weight.

No pup mortality was observed in 13.17% CP diet group, but 8 and 18% mortality was found in 16.64 and 21% CP diet groups, respectively. Sanchez *et al.*, (1985) also reported litter mortality was highest for doe fed 20.5% CP than does fed 17.5% CP diet. But, El-Hady (2001) observed that mortality rate from birth to weaning was significantly ($P<0.01$) lower at the 19% CP level than other levels of CP (15 & 17%). High percent of mortality in high percent of CP diet groups were occurred, probably due to malnutrition caused higher competition for milk suckling among the pups because of higher number of litter size.

Average body weight loss from mating to kindling and kindling to 14 days of weaning were lower (but not significantly) in does fed 21% CP diet than the other does

Fig.1. Effect of does feeding of three levels of protein on live weight changes of pups from birth to weaning

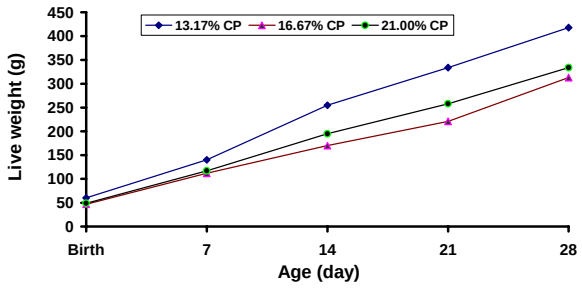

Table II. Reproductive performance of does fed on different levels of supplemental diets

Parameter	Supplemental diets			SEM	Level of significance
	13.17% CP diet	16.64% CP diet	21.00% CP diet		
Pregnancy rate (%)	40	60	100	-	*
Gestation period (days)	32.3±0.4	32.0±0.3	31.6±0.4	0.35	NS
Litter size at birth (number)	2.0±1.4	4.3±1.2	4.4±0.9	1.1	NS
Litter weight (g) at birth	120±85	200±46	212±34	47	NS
Individual pup weight (g) at birth	60.0±0	46.7±4.2	49.0±6.9	5.7	NS
Litter size at 28 days of weaning (number)	2.0±1.4	4.0±1.0	3.6±1.1	1.2	NS
Litter weight (g) at 28 days of weaning	690±177	1191±55	1164±289	234	NS
Individual pup weight gain (g) upto weaning	355±204	267±91	285±67	106	NS
Mortality (%)	0	8	18	-	*
No. of pups alive upto weaning	20	60	90	-	-

[a b] Mean values with different superscripts within the same row differ significantly (P<0.05); [NS] Not significant, * P<0.05

Table III. Productive performance of does fed on different levels of supplemental diets

Parameter	Supplemental diets			SEM	Level of significance
	13.17% CP diet	16.64% CP diet	21.00% CP diet		
Body wt. changes (g) from mating to kindling	-40±28	-37±40	-22±42	40	NS
Body wt. changes (g) from kind. to 14 d weaning	-100±99	-53±29	-34±9	42	NS
Body wt. changes (g) from 14 to 28 d weaning	-40^{a}±14	-19^{ab}±8	-16^{b}±8	9	*
Total DM intake (g/d) from mating to kindling	95.0±1.4	99.7±0.6	98.6±2.3	1.87	NS
Total DM intake (g/d) from kindling to weaning	130^{a} ±3	149^{ab}±11	151^{b}±4	6.89	*

[a b] Mean values with different superscripts within the same row differ significantly (P<0.05); [NS] Not significant, * P<0.05

fed 13.17 and 16.64% CP diet. Nevertheless, at 14 to 28 days of weaning, body weight loss was significantly (P <0.05) lower in does fed 21% CP diet, especially in the does fed 13.17% CP diet (Table III). Body weight loss during the period of kindling to weaning was also reported by Sanchez *et al.* (1985). These losses of body weight might be due to either shortage of protein in the diet (13.17% CP) and or catabolism of muscle tissues to provide for milk synthesis.

Total dry matter intake (DMI) from mating to kindling of does was found similar among groups. On the other hand, from kindling to weaning, significantly (P<0.05) lower DMI was observed in does fed diet containing 13.17% CP diet than the does fed 16.64 or 21.00% CP diet (Table III). Anandan and Dey (1998) also found no significant difference of DMI between high protein (30% CP) diet and normal protein (17% CP) diet fed group of does.

The observation reveal that concentrate mixtures containing 21% CP diet along with *ad libitum* green grass proved for better reproductive performance of does under tropical condition.

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