

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

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### ABSTRAK

Satu kajian telah dikendalikan melebihi tempoh 125 hari dengan 150 arnab yang dibahagikan secara rawak kepada tiga kumpulan rawatan dengan setiap satunya 50 ekor. Arnab-arnab tersebut diberi makan satu daripada makanan diet mengandungi 13.17, 16.64 dan 21.00% tambahan protein kasar dengan rumput hijau ad libitum (*Hymenachne pseudointerrupta*, CP = 6.6%). Tempoh hamil saiz dan berat haiwan (semasa kelahiran dan bercerai susu), berat anak anak arnab semasa kelahiran secara individu dan berat diperolehi selepas bercerai susu (28 d) tidak berbeza ( $p > 0.05$ ) di kalangan kumpulan-kumpulan rawatan. Kadar kehamilan arnab dan kematian anak arnab sehingga bercerai susu memberi kesan signifikan ( $p < 0.005$ ) di kalangan kumpulan rawatan. Min kadar kehamilan adalah paling tinggi (100%) dalam kumpulan yang diberi makan 21.00% diet CP (protein kasar) manakala bilangan anak arnab yang hidup sehingga bercerai susu paling tinggi (100%) dalam kumpulan yang diberi makan 13.17% diet CP (protein kasar) bersama-sama rumput hijau ad libitum boleh dicadangkan untuk pelaksanaan pengeluaran semula arnab yang lebih baik di bawah keadaan tropika.

### ABSTRACT

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 21.00% crude protein (CP) supplementation with ad libitum green grass (*Hymenachne pseudointerrupta*, CP=6.6%). Gestation period, litter size & 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. The mean of the pregnancy rate was highest (100%) in the group fed on 21.00% CP diet, while the number of pups alive up to weaning was highest (100%) in the group fed on 13.17% CP diet. Based on these findings, the inclusion of 21.00% CP diet along with ad libitum green grass may be suggested for better reproductive performance of does under tropical conditions.

### 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 to be 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 generation interval and ability to breed immediately after parturition. No other animal has this amazing reproductive efficiency. Rabbit raising involves investment and women and children easily accomplish its husbandry in the home.

Proteins are essential organic constituents of living organisms. All living cells synthesize

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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. Less research work has been done on the requirement of protein for optimal reproductive performance of rabbits under tropical conditions. Therefore, the present research work has been undertaken to study the effect of different levels of crude protein supplementation on the reproductive performance of does.

### MATERIALS AND METHODS

The experiment was conducted over a 125 day period at the Animal Nutrition Field Laboratory of Bangladesh Agricultural University, Mymensingh with 150 New Zealand White domestic does (60 bucks, for breeding purposes). The does were 12-13 months of age having an initial live weight of 2000-3000 g. The does were randomly assigned to three experimental animals groups of 50 each in a completely randomized design (CRD). All of the experimental animals were housed individually in steel Quonset - style cages measuring 1.95 m x 1.80 m x 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 x 20 cm x 62 cm. J-shaped screened metal feeders and 250 ml bottle waterers were pro-

vided at the front of each cage. The animals were closely observed during the experimental period to check the mortality rate and any disease problem. Thirty days into the start of the experiment, the does were transferred to the buck's cage for mating and kept there for 2 hours and then returned to their own cages. Similarly, all the does of the three experimental groups were allowed to mate. After 2 days, all the does bred again randomly by different bucks. At the end of the gestation period (28 d), each doe was provided with one wooden nest containing straw inside.

Three experimental diets were formulated with three levels of supplemental crude protein viz 13.17, 16.64 and 21.00% CP with similar levels of ME (2486-2521 kcal/kg). The ingredients and nutrient composition of the diets were calculated according to the guidelines of the Association of Official Analytical Chemists (AOAC), 1984 and shown in Table 1. The does were fed on one of three formulated diets (concentrate) along with ad libitum green grass (*Hymenachne pseudointerrupta*, 6.6% CP) twice daily, at 8.00 a.m and at 3.00 p.m. Clean fresh water was made available to the rabbits at all times.

Animals were weekly weighed before the morning feed. The live weight changes and food intakes were recorded. Pregnancy rate, gestation

TABLE 1  
Ingredient and nutrient compositions of supplemental diets

Ingredient	Supplemental diets		
	13.17%CP	16.64%CP	21.00%CP
<b>Concentrate mixture (kg/100kg):</b>			
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-Methionine	0.15	0.15	0.15
<b>Nutrient composition:</b>			
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: AOAC, 1984. *Official Methods of Analysis*. 14<sup>th</sup> Edn. Washington DC: Association of Official Analytical Chemists.

\*Calculated from the *Manual of Selected Topics in Animal Nutrition* by W. Close and K.H Menke (1976).



period, litter size, litter weight, pup weight gain and pup mortality were recorded regularly. Data were analyzed using the method described by Steel and Torrie (1980). The 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.

**RESULTS AND DISCUSSION**

The reproductive performance of does fed different levels of CP diet (Table 2) indicates that the pregnancy rate of the does was significantly ( $P<0.05$ ) influenced by the CP content of diet. It was at the maximum level in does fed a diet containing 21.00% CP.

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

At birth, the average litter size and litter weight were smaller but not significantly in the does fed 13.17% CP diet than the does fed 16.64 and 21.00% CP diet. Similar results were reported by Aganga *et al.* 1991 and Sanchez *et al.* 1985. They obtained a maximum litter size (7.18) by using higher levels of CP(21.00%) in the 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 a result of smaller litter size (Yono *et al.* 1986 and Lebas 1980). Average litter size (2.0, 4.0 & 3.6) and litter weight (690, 1191 & 1164 g) at weaning were not affected. These results were in accordance with the observations of Sanchez *et al.* 1985 and Yono *et al.* 1986. But other workers (Anandan and Dey 1988) found that litter size was significantly ( $P<0.01$ ) higher in does fed 30% CP diet than the does fed 17% CP diet.

Individual pup weight of does fed 13.17% CP diet increased at a higher rate (355 g) up to weaning (28 d) than the other does fed 16.64 and 21.00% CP diet (Fig. 1). Higher growth rate of pups on the low protein diet (13.17% CP) was probably caused by the lower number of pups per litter and consequently less competition for milk resulting in a heavier individual pup weight. No pup mortality was observed in the 13.17% CP diet group, but 8% and 18% mortality were found in the 16.64% and 21.00% CP diet groups respectively. Sanchez *et al.* (1985) also reported that litter mortality was higher for does fed 20.5% CP than does fed 17.5% CP diet. A high percent of mortality occurred in a high percent of CP diet groups, probably due to malnutrition caused by higher competition for milk among the pups because of the larger litter size.

Average body weight loss from mating to kindling and kindling to 14 days of weaning was lower (but not significantly) in does fed 21.00% CP diet than the other does fed 13.17% and 16.64% CP diets. Nevertheless, at 14 to 28 days of weaning, body weight loss was significantly

TABLE 2  
Reproductive performance of does fed on different levels of supplemental diets

Parameter	Supplemental diets			SEM	Level of significance
	13.17% CP diets	16.64% CP diets	21.00% CP diets		
Pregnancy rate (%)	40	60	100	-	*
Gestation period (days)	32.3±1.4	32.0±0.3	31.6±0.4	0.35	NS
Litter size at birth	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	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) up to weaning	355±204	267±91	285±67	106	NS
Mortality (%)	0	8	18	-	*
No. of pups alive to up to weaning	20	60	90	-	-

<sup>ab</sup> Mean values with different superscripts within the same row differ significantly ( $P<0.05$ ).

<sup>NS</sup> Not significant, \* $P<0.05$ .



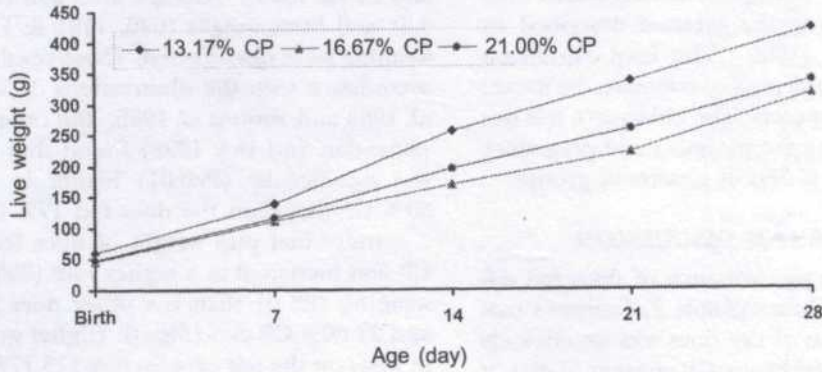


Fig. 1: Effect of does feeding on three levels of protein on live weight changes of pups from birth to weaning

TABLE 3  
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 of kindling	-40±28	-37±40	-22±42	40	NS
Body wt. Changes (g) from kindling to 14 d weaning	-100±99	-53±29	-34±9	42	NS
Body wt. Changes (g) from 14 to 28 d weaning	-40±14	-19±8	-16±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 intake (g/d) from kindling to weaning	130±3	149 <sup>ab</sup> ±11	151 <sup>b</sup> ±4	6.89	*

<sup>ab</sup> Mean values with different superscripts within the same row differ significantly (P<0.05).

<sup>NS</sup> Not significant, \*P<0.05.

(P<0.05) lower in does fed 21.00% CP diet, especially in the does fed 13.17% CP diet (Table 3). Body weight loss during the period of kindling to weaning was also reported by Sanchez *et al.* (1985). This loss 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 a diet containing 13.17% CP diet than the does fed 16.64% or 21.00% CP diets (Table 3). Anandan and Dey (1998) also found no significant difference of DM intake between does fed high protein (30% CP) diets and normal protein (17% CP) diets.

The observations reveal that concentrate mixtures containing 21.00% CP diets along with *ad*

*libitum* green grass resulted in better reproductive performance of does under tropical condition.

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