



Performance of rabbits fed diets with varying concentrate and fodder ratio in north eastern region of Tripura

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ABSTRACT

A study on growth performance of 24 male New Zealand White (NZW) rabbits was conducted to work out an economical feeding system. Rabbits were randomly distributed into 4 groups of 6 animals each. Animals in group T₁ were provided only concentrate mixture whereas in group T₂, T₃ and T₄ were provided concentrate mixture and cowpea in ratio of 75:25, 50:50 and 25:75 on DM basis, respectively. The study was conducted for 42 days. From 28 day onwards, BW was higher in T₁ followed by T₂, T₃ and T₄. Total weight gain and ADG (g/d) were significantly higher in T₁. Total DMI and DMI (g/d) were significantly higher in T₄ than other groups. Feed efficiency was highest in T₁ and lowest in T₄. The average value of DM, CP, EE, TA and NFE digestibility were unaffected. But CF digestibility was significantly higher in T₃ than T₂. Blood urea and blood urea nitrogen (BUN) was significantly lower in T₄ than other groups. Lowest cost of production and highest net profit/kg live weight of rabbit was observed in T₁ than other groups. Net profit per rabbit was highest in T₁ and lowest in T₄. It was concluded that weight gain of about 12g/d can be achieved in NZW rabbit maintained either on concentrate mixture or concentrate mixture with cowpea in the ratio of 75:25 or 50:50 without any adverse effect in hot humid climate of Tripura.

Key words: Body weight, Concentrate, Digestibility, Economics, Performance, Rabbit

Tripura is mostly populated by tribal population and meat is one of the major protein sources in this area. Rabbits have a role in the supply of animal protein to humans. One of the major advantages of rabbit farming is that forage and agricultural by-products which are unsuitable for human consumption can be used as animal feed to reduce the production costs.

Strategies for enhancing the production potential of rabbits especially in tropical and subtropical regions of the world have not been fully exploited (Falcão-e-Cunha *et al.* 2007). Bamikole and Ezenwa (1999) reported that feeding of rabbits solely on some forage species in the tropics has resulted in negative effect of weight loss. Rabbits perform better when fed with mixture of forage and concentrate to reduce cost of feeding as well as the total cost of production for the small scale rabbit producers (Ojewola *et al.* 1999). However, little information is available on the appropriate combination of fodder to concentrate for optimum

performance of rabbits in hot humid climate of Tripura. Hence, the present experiment was conducted to evaluate the effect of various combinations of fodder to concentrate ratio on growth performance of rabbits in climatic conditions of Tripura.

MATERIALS AND METHODS

The study was carried out at the Rabbit Breeding Farm, R K Nagar, under Department of Instructional Livestock Farm Complex.

Animals, management and growth trial: Twenty four male weanlings New Zealand White (NZW) rabbits (6 weeks old; 633.75±15.40 g average initial body weight (BW)) were randomly distributed into 4 groups of 6 each. Rabbits were individually housed in iron cages fitted with feeders and watering bowls under the same hygienic, environmental and management conditions in a well-ventilated building and the experiment was conducted up to 12th week of age. BW (g) was recorded weekly and feed consumption (g/d) was recorded daily. Each rabbit was weighed individually before the morning feeding.

Experimental design and treatments: The experimental rabbits were allotted to 4 groups (T₁, T₂, T₃ and T₄). The rabbits in group T₁ were fed only concentrate mixture whereas rabbits in group T₂, T₃ and T₄ were fed concentrate mixture and cowpea in the ratio of 75:25, 50:50 and 25:75 on DM basis, respectively. The physical and chemical

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composition of the diet is presented in Table 1. The concentrate was given to the animals in morning and evening and fodder was given to the animals in evening. The refusal was recorded next day before offering the fresh feed.

Digestibility trial: The trial was conducted using 8 male NZW rabbits at the end of the experiment. Two rabbits from each group were randomly selected to determine the nutrient digestibility of the experimental diets. Rabbits were kept individually in iron cages that allowed faecal collection. The feed actually consumed and total faecal output was measured for 4 consecutive days according to the European reference method for rabbit digestion trials (Perez *et al.* 1995). Feed was offered once daily at 10:00 AM and actual feed intake was determined. During the collection period, faeces from each rabbit were collected before offering the daily meal. Samples of daily faeces (20%) of each rabbit were collected, dried at 105°C for 24 h, bulked, mixed, ground to 1 mm and kept for further chemical analysis. At the end of collection period, all faecal samples of 4 days from each rabbit were composited, ground and stored to

form one sample for each rabbit. Representative samples of feed offered and faeces of each rabbit were analysed for dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF) according to AOAC (2005).

Statistical analysis: The data were analyzed using two way ANOVA (Sigma Plot software, version 11.0; SPSS Inc., Chicago). The results were expressed as mean and pooled standard error of mean.

RESULTS AND DISCUSSION

The BW of rabbit did not show any significant effect up to 21 d. But, from 28 d onwards BW was higher ($P<0.05$) in T₁ followed by T₂, T₃ and least in T₄ (Table 2). The result showed that T₁ group reached the highest ($P<0.05$) final BW which was 6.51%, 10.97% and 33% less in T₂, T₃, T₄, respectively.

Total weight gain (g) and ADG (g/d) were significantly ($P<0.05$) higher in T₁, T₂, T₃ compared to T₄ (Table 3). Final BW and total gain were significantly higher in T₁ due to the fact that better feed efficiency on concentrate diet. This may be due to the fact that fodder constituted 25, 50 and 75% of total dry matter intake (DMI) in T₂, T₃ and T₄, respectively leading to poor supply of nutrients to growing rabbits. These finding are similar to Prasad *et al.* (1996) and Hasanat *et al.* (2006). In contrast, Adeyemo *et al.* (2013) reported no significant difference in final weight of rabbits fed different ratio of concentrate to roughage but a higher final weight was recorded with dietary treatment having 75% concentrate and 25% roughage, compared to that having 100% concentrate. As the percentage of fodder increased in the dietary treatment, the final weight decreased. Reduced weight gain was observed in T₄ (fed 25% concentrate and 75% fodder) which may be due to higher percentage of fodder consumption. Total DMI and DMI (g/d) were significantly ($P<0.05$) higher in T₄ than T₁, T₂ and T₃. Overall DMI (g/d) was 35.40, 12.14 and 1.21% higher in T₄ than T₁, T₂, T₃, respectively. Similar

Table 1. Ingredient and chemical composition of concentrate mixture

Ingredient composition (%)	
Wheat	42.90
Soya	5.00
GNC	25.00
Rice polish	10.00
Wheat bran	15.00
Vitamin and mineral mixture*	1.10
Salt	1.00
Chemical composition (% on DM basis)	
OM	95.03
Crude protein	21.10
Ether extract	2.59
Crude fibre	6.82
Total ash	4.97

*Vitamins and mineral premix per kilogram contained: 2,000,000 IU vitamin A, 150,000 IU vitamin D₃, 0.33 mg vitamin K, 0.33 mg vitamin B₁, 1.0 g vitamin B₂, 0.33 g vitamin B₆, 1.7 mg vitamin B₁₂, 66.7 mg pantothenic acid, 16.6 mg Se, 1.33 mg Co, 0.5 g Cu, 16.6 mg I and 10.0 mg antioxidant.

Table 2. Effect of experimental diets on weekly changes of body weight of NZW rabbits

Period (days)	T ₁	T ₂	T ₃	T ₄	SEM
0 d	632.33	633.50	634.50	634.67	15.40
7 d	641.83	674.67	638.83	635.67	14.18
14 d	757.33	754.00	705.83	671.67	15.61
21 d	832.83	806.50	768.83	727.67	18.69
28 d	912.67 ^b	883.67 ^{ab}	867.00 ^{ab}	787.17 ^a	20.29
35 d	1009.50 ^b	971.67 ^b	902.50 ^{ab}	810.00 ^a	29.21
42 d	1120.50 ^b	1052.00 ^{bc}	1009.67 ^c	841.50 ^a	30.01

^{ab}Means bearing different superscript in row differ significantly ($P<0.05$).

Table 3. Effect of experimental diets on growth performance of NZW rabbits

Parameter	T ₁	T ₂	T ₃	T ₄	SEM
Initial body weight (g)	632.33	633.50	634.50	634.67	15.40
Final body weight (g)	1120.50	1052.00	1009.67	841.50	30.00
Total body weight gain (g)	488.17 ^b	418.50 ^{bc}	375.17 ^c	206.83 ^a	24.62
	±13.01	±24.01	±10.84	±41.26	
Total DM intake (g)	4191.3 ^a	5060.90 ^c	5607.32 ^b	5675.79 ^b	179.42
	±19.23	±8.02	±30.02	±35.81	
DM intake (g/day)	99.80 ^a	120.50 ^c	133.51 ^b	135.13 ^b	4.27
	±0.46	±0.19	±0.72	±0.85	
ADG (g/d)	11.62 ^b	9.96 ^{bc}	8.93 ^c	4.92 ^a	8.86
	±0.31	±0.57	±0.26	±0.98	
Feed efficiency (%)	11.51 ^b	8.20 ^{bc}	6.64 ^c	3.44 ^a	0.91
	±0.38	±0.52	±0.23	±0.86	

^{ab}Means bearing different superscript in a row differ significantly ($P<0.05$).

Table 4. Effect of experimental diets on nutrient digestibility and serum biochemical indices

Parameter	T ₁	T ₂	T ₃	T ₄	SEM
<i>Digestibility (%)</i>					
DM	85.26	84.21	87.49	81.58	0.90
CP	81.34	78.34	81.68	73.06	1.49
EE	82.48	82.46	81.57	77.28	1.26
CF	56.75 ^{ab}	50.01 ^a	66.09 ^b	62.91 ^{ab}	2.03
TA	60.74	58.94	70.87	65.03	1.93
NFE	92.07	92.65	93.94	89.24	0.77
<i>Serum biochemical constituents</i>					
Blood urea (mg/dl)	44.34 ^b	35.71 ^b	23.49 ^{ab}	16.19 ^a	3.83
Blood urea nitrogen (mg/dl)	18.15 ^b	16.68 ^{bc}	10.97 ^{ac}	7.56 ^a	1.59
Total protein (gm/dl)	5.19	4.92	4.51	3.81	0.22
Albumen (g/dl)	2.82	2.95	2.62	2.11	0.14
Globulin (gm/dl)	2.37	1.97	1.89	1.70	0.11
A:G ratio	1.20	1.55	1.39	1.24	0.07

^{ab}Means bearing different superscript in a row differ significantly (P<0.05).

Table 5. Economics of rabbit maintained on different diets (per rabbit)

Attribute	T ₁	T ₂	T ₃	T ₄
Cost of young rabbit at 35 days @ ₹ 100/rabbit	100	100	100	100
Cost of concentrate @ ₹ 25.00/kg	0.95	0.73	0.48	0.23
Cost of fodder @ ₹ 1/kg	—	0.07	0.13	0.18
Total feed cost (₹)	0.95	0.80	0.61	0.41
Labour cost @ ₹ 148.54/day	0.74	0.74	0.74	0.74
Miscellaneous cost (₹)	12.00	12.00	12.00	12.00
Total cost incurred (₹)	113.69	113.54	113.35	113.15
Weight at 12 weeks (kg)	1.121	1.052	1.010	0.842
Selling rate @ ₹ 200/kg BW	224.20	210.40	202.00	168.40
Net profit/rabbit (₹)	110.51	96.86	88.65	55.25
Net profit per kg live weight (₹)	98.58	92.07	87.77	65.62
Cost of production/kg weight (₹)	101.41	107.93	112.23	134.38

*Assumption was made that one labour can look after 200 rabbits; ₹, Indian rupee.

wide variation of DMI (80.7 to 194 g/day) was also reported by Bhatt *et al.* (2005). Total DMI through concentrate and fodder was markedly (P<0.05) higher in T₄ than T₁, T₂ and T₃ because of cowpea which also indicated that cowpea fodder was more palatable to rabbits than sole concentrate ration. This result is similar to the observations of Prasad *et al.* (1996) and Adeymo *et al.* (2013).

Feed efficiency was highest in T₁ and lowest in T₄, and this can be attributed to higher percentage of fodder and poor nutrient retention by the animals in T₄. DMI (g/d) was highest in T₄ and lowest in T₁ which may be due to variation in energy densities of the rations. The average value of DM,

CP, EE, TA and NFE digestibility were not affected significantly (P>0.05) in the present study (Table 4). But the digestibility of CF decreased in T₁ and T₂ (P<0.05) than T₃ and T₄. Our result is similar to the finding of Xiccato and Cinetto (1988) who reported low fibre digestibility at high nutrient level and vice-versa.

Among the serum biochemical constituents, total protein, albumen, globulin and A:G ratio were not affected by dietary treatment (Table 4). But blood urea and blood urea nitrogen (BUN) were significantly lower (P<0.05) in T₄ than T₁, T₂, T₃ group. Blood urea and BUN level was highest in T₁ which may be due to concentrate feeding. These findings are similar to the observation of Adeymo *et al.* (2013).

A balance of expenditure incurred and return obtained was calculated keeping in view the prevailing market price (Table 5). The rearing cost included the cost of young rabbit at 42 days, feed cost and labour cost. The cost of production was the lowest and net profit/kg live weight of rabbit was the highest in T₁ as compared to other groups. These findings are similar to the report of Prasad *et al.* (1996). The results also showed that net profit per rabbit was highest in T₁ and lowest in T₄. The economic viability of rabbit production in T₁ followed by T₂, T₃ was more profitable than T₄ group.

It can be concluded that a growth rate of approximately 12 g/day can be achieved in rabbits by either feeding 100% concentrate or 75% concentrate along with 25% fodder which in turn will lead to financial benefit under tropical condition of Tripura.

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