REPLACEMENT EFFECT OF ROUGHAGE BY KITCHEN WASTE ON GROWTH PERFORMANCES OF RABBIT

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December, 2016

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DEDICATED TO MY BELOVED PARENTS AND ALL WELL WISHERS

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LIST OF ABBREVIATIONS

Abbreviation	Elaboration
%	Percentage
**	Significant at 1% level of probability
*	Significant at 5% level of probability
CP	Crude Protein
CF	Crude Fibre
DM	Dry Matter
NFE	Nitrogen Free Extract
EE	Ether Extract
g	Gram
FCR	Feed Conversion Ratio
SGPT	Serum Glutamic Pyruvic Transaminase

ABSTRACT

The present study was conducted to evaluate the replacement effect of roughage by kitchen waste on growth performance, sero-biochemical profile and nutrient digestibility of growing rabbit. There were three dietary treatment groups including 40 gram concentrate and *adlibitum* fodder, 40 gm concentrate and *adlibitum* road side grass and 40 gm concentrate and *adlibitum* kitchen waste of T_1 T_2 and T_3, respectively. Forty five weaned crossbred New Zealand White growing rabbits (aged about 40 days) were distributed into three treatment groups in a completely randomize design for a period of 30 days. Weekly dry matter intake was not significantly influenced by feeding kitchen waste. The feed conversion ratio was not significantly differed among the treatment groups, where highest feed conversion ratio was found in 40 gm concentrate and *adlibitum* kitchen waste group. Final body weight, cumulative body and weekly body weight gain was not differed significantly in either of three dietary treatments. The nutrient digestibility of different proximate components differed significantly ($p<0.05$)among different treatment groups. The digestibility of dry matter and crude fiber, and availability of ash were found highest (63.45%, 56.47% and 63.53%, respectively) in T_3 group (kitchen waste group). The digestibility of crude protein (63.53%), ether extract (56.78%) and nitrogen free extract (56.71%) were highest in T_2 treatment group (Road side grass group). The serum biochemical parameters like- total protein, albumin, phosphorus, calcium, glucose, creatinine, urea and SGPT were varied significantly among the treatment groups but the value was within the normal limits. The study showed that kitchen waste might be efficiently used as a roughage replacer in broiler rabbit diet without affecting the performance of the animals.

Key words: Kitchen Waste, Nutrient Digestibility, FCR and Serum Biochemistry.

CHAPTER-I

INTRODUCTION

Micro-livestock such as the rabbit, guinea pig, grass-cutter, giant rat, iguana and pigeons have been suggested (Vietmeyer, 1984) as a rapid mean of obtaining animal proteins. In order to maximize food production in Bangladesh, all reasonable options must be considered and evaluated. Among those, the use of micro livestock like rabbit will be the option rather than other species of animal agriculture. Furthermore, there is an increasing interest in the diversification of animal production system in Bangladesh to produce products, which are not surplus nationally. The climatic condition, commercial factors, local environment, religious points of view, social practices as well as technological aspects support the rabbit raising potentials in Bangladesh (Williams and Wooley, 1992). Hamill et al. (1981)emphasized that, in developing countries where critical national meat shortage exist, the potential for rabbit production was greatest. Nevertheless, rabbits are easy to handle and can be raised under primitive condition. They require little financial involvement and women and children can accomplish their husbandry at home. Therefore, farmers who are interested in an alternative livestock enterprise with low capital & labor investment may consider the rabbit farming in this country.

Rabbit is a small burrowing mammal of the hare family with long ear, short tails and long hind legs. Their foods are roughages, homegrown vegetable, cereal grains, concentrate made into pellets, grasses among others. It can be said that rabbit is efficient animal for converting kitchen waste and nonconventional feed stuff into meat in the same vein. Rabbit adapt to Simple environment, in hutches, that all the breeds of rabbit are prolific breeders. It is also a good source of white meat, with-low fat, and cholesterol, with useful wool (fur), skin, manure (Carroll and Hamilton, 1975). Rabbit production is a new development in the region, which plays an important role in view of the economic risks by the spread of Asian bird flu (McNitt et al., 2013). According to the FAO (2001), backyard rabbit keeping provides additional income and supplies additional protein for poor rural and urban households with low investment and labor inputs. Rabbits have small body size, short generation interval, high reproductive potential, rapid growth rate, genetic diversity, and the ability to utilize forages and by-products as major diet components that make the animal appropriate for small livestock keeping in developing countries (Cheeke, 1986). Rabbit can be maintained as viable instrument and an aspect of tool capable of promoting and surviving meat availability (Budnick, 2014).

Kitchen wastes are nutrient rich surplus materials, which have higher Crude protein and energy value (Westendorf and Myer, 2004) and can be used as regular feeds for pigs (Saikia and Bhar, 2010). These can be collected from households, hotel, hostel, restaurants and other sources at minimal price, and fed pigs as such or after boiling. These nutrient dense surplus bio wastes can be fed to rabbits in their early growing stage for better growth rate. This favorable early growth may have positive effect on overall production, reproduction and carcass quality in latter stages.

Considering the above discussions in mind, the current research work was designed to familiarize rabbit as a source of animal protein by using kitchen waste as a sole source of feed with the following objectives:

Specific objectives of the study

1. To evaluate the growth performance of rabbit using kitchen waste as roughage.
2. To evaluate the effect of kitchen waste in FCR of rabbit by replacing roughage.
3. To prepare the least cost ration for rabbit using kitchen wastes.

CHAPTER-II

REVIEW OF LITERATURE

In developing countries, rabbit production may be a profitable enterprise because low grain diets based on high roughage and by products can be used (Dhaubhadel, 1992). Proper care and improved management are necessary to raise the rabbit successfully because rabbit is a promising livestock species having versatile qualities in terms of production, pattern of reproduction, neonatal development, nutrient requirements and feeding habits. Studies in many countries relating to nutrition, digestive physiology, feeding practice and growth of domestic rabbit are discussed in the following sections:

2.1. Nutrition of Rabbit

Rabbits are non-ruminant, but they are herbivores animal. They have a distended hindgut (Sakaguchi, 2003). The rabbits are also adapted to the use of a high-roughage diet, but it has a different digestive strategy than the ruminant and the colon fermenter (hind gut fermenter) (Cheeke, 1981; Cunha and Cheeke, 2012). Hintz et al. (1978) concluded that "hind gut fermentation is a superior adaptation for dealing with high fiber herbage, provided that intake is not limited by the actual quantity of herbage available".

Rabbit can be successfully raised on diets containing forage and cereal by-products and it consumes many kinds of feeds satisfactorily. In practice, diets can be based largely on herbage, grasses, legumes, leaves, crop residues and kitchen scraps. Fresh green feeds can be used in moderate amounts for feeding rabbits with no drop in production (NRC, 1977).

Lowe (2010) reported that the daily dry matter requirements can be estimated as 100-120g for adults and for young animals between 1 to 2.5 months of age; at the age of 3 to 4 months 150-180g for the young animal. For pregnant animal, the DM requirement is 150-180g and for nursing does is 300-400g depending on the number of young. Lukefahr and Goldman (1985) concluded that the rabbits can be fed a diet based on legume and grass forages supplemented with table scraps, kitchen waste and crop residues such as surplus or damaged bananas, mangoes and other fruits.

However, Cheeke (1987); (Cunha and Cheeke, 2012) stated that full feeding on green grasses may not support a satisfactory growth rate of fryers or maintain a producing doe in adequate condition. A growth rates of 25g per day over a 4 weeks period when weaning rabbits were fed fresh green clover vegetable leaves with no other supplements. Supplementation is particularly important for new born and lactating females, whose diet must contain about 16% protein and at least 18% fiber (NRC, 1977).

2.2. Energy Requirement of Rabbit

Many workers conducted experiments with different levels of energy in the diet to study their effects on growth and reproductive performance of rabbits.

The study of (Hasanuzzaman et al., 2001)revealed that growth performances were not affected by dietary energy levels of the doe and they concluded that 2500 kcal/kg diet may be appropriate for growth and reproductive performance of rabbit does.

Xiangmei (2008)stated that, there are differences in energy requirement for growing rabbits with different experiments and detected methods. (Gordon et al., 1988) concluded that good reproductive performance of does occurs when fed diets of 2500-2900 kcal Digestible energy (DE) per kg.

The energy requirements for various productive functions (growth, lactation and gestation) have received more attention now a day. According to NRC (1977) digestible energy (DE) concentration of 2500 kcal per kg diet is needed to meet the requirements for rapid growth but at energy levels lower than this the rabbit may not be able to consume sufficient feed to meet its requirements for maximum growth. The daily ME requirement for an adult rabbit is 200 kcal and can be provided with diets containing 2100-2200 kcal of DE per kg (NRC, 1977). About 9.5 kcal of DE is required for each gm of body weight gain and no further increase in growth performance occurs with DE levels exceed 2500 kcal/kg (Gordon et al., 1988).

Rabbits are rapidly growing animal and required diets that contain high energy, protein and mineral for their growth (Table 2.1).

Table 2.1:Nutrient requirements of rabbits; (NRC, 1977)

Nutrient (%)	Requirement
ME (Kcal/kg DM)	2700
CP	16
CF	15-18
Fat	2-3
Calcium	0.4-1.10
Phosphorus	0.20-0.50
Magnesium	0.16-0.35
Potassium	0.5-1.0
Sodium	0.2-0.3
Chorine	0.3-0.35

2.3. Protein Requirement of Rabbit

Protein is the most essential nutrient for better growth and reproductive performance such as growth rate, gestation period, litter interval, litter size, litter weight, litter born alive, age at first kindling etc.

Many workers conducted experiments with different levels of protein in the diet to study their effects on growth and reproduction of rabbits.

The experiment conducted by Lohakare et al. (2006) showed that live weight gain, feed conversion ratio, crude protein utilization, performance index and blood urea were increased by increasing dietary protein levels with no significant difference between groups fed 16 or 18% CP in most growth performance traits. Vietmeyer (1985)reported that live weight of does fed 17.5% CP was lower than the other treatments (19.0 or 20.5% CP) after 21 and 28 days of lactation. Ayyat (1994) reported that daily live weight gain increased with increasing protein concentration in the diet of rabbits.

Protein requirements for rabbits depend in part on protein quality. For rapid growth, rabbits are dependent upon adequate quantities of dietary essential amino acids. Dietary CP levels of 12, 16, 15 and 17% are recommended for maintenance, growth, pregnancy and lactation respectively (NRC, 1977) for rabbits. However, Arrington and Kelley (1976) suggested that, a dietary crude protein content of 15% was adequate for all except young stock and lactating does which needed 16 to 17% CP. Hemid et al. (1995) conducted an experiment to investigate the effect of diets containing two levels of protein (15 or 17.5%) on the reproductive performance of medium New Zealand White (NZW) and light France rabbits. The pregnant and lactating does were fed on diets containing 15 or 17.5% crude protein and digestible energy 2500 kcal/kg. The experiment showed that 17.5% protein diet gave larger litter size, lower mortality and increased number of parities by reducing gestation length and litter intervals compared with 15% protein diet.

Lebas et al. (1986) conducted an experiment suggested that *adlibitum* green grass plus supplementary concentrate mixture of 15.71% CP content was the best for optimum growth and carcass characteristics of rabbits under Bangladesh condition. Similarly, another study with New Zealand White (NZW) rabbits indicated that soybean meal diet containing 17.5 or 20% CP gave highest live weight gain followed by gluten and soybean meal plus maize gluten diets with 17.5% CP (Sonbol et al., 1992). An experiment was performed by Salma et al. (2002) to study the effect of feeding different levels of supplemental protein on reproductive performance of rabbit does and effect of mother nutrition on the subsequent performance of weaned litter. Three supplemental diets (concentrate mixture) were formulated with wheat, wheat bran, maize, til oil cake, soybean meal to contain three levels of protein i.e. 13.71, 16.64 and 21.00% CP along with adlibitum green grass. Higher CP% improved reproductive performance of rabbit does and the post weaning performance of litters.

2.4. Digestibility of Nutrients inRabbit

Saipaul et al. (2005) conducted an experiment to study the influence of supplemental *Saccharomyces cerevisiae*and, *Lactobacillus acidophilus*on nutrient digestibility in Soviet Chinchilla male rabbits (20; 1 year old of 3.53±0.15 kg BW) randomly divided into four equal groups. Their study concluded that a combination of Lactobacillus and Saccharomyces was beneficial in improving the CP and CF digestibility of the diet in rabbits in comparison to either of the two alone.

Meo et al. (2007) conducted an experiment to determine the effect of feed restriction on performance and feed digestibility in rabbits. Two hundred and fifty-six Hylarabbits were equally divided into two groups fed the same commercial concentrates supplied *adlibitum*or restricted to 90% of *adlibitum* from weaning (35 d) to slaughter (85 d). Mortality was recorded daily. The feed restriction group rabbits showed significantly higher apparent digestibility for almost all the nutrients (except crude protein and ether extract) in particular for the crude fiber, NDF and ADF, confirming a higher residence time of the feeds in the digestive system.

2.5. Feed Intake and Growth Performance of Rabbit

Bhatt et al. (2005) conducted an experiment to assess the effect of feeding different levels of concentrate on the production performance of broiler rabbits. Rabbits (n=83) were divided into 3 groups and were offered concentrate pellets at 50g, 80g and *adlibitum*. The effect of the level of concentrate feeding was significant on growth, plane of nutrition and digestibility of nutrients. The gain/day was highest (27.6+or-0.5 g) in *adlibitum* fed groups and the differences were significant when compared with the group fed 50g and non-significant with the group fed 80g concentrate. However, non-significant effect of concentrate feeding was observed on roughage intake. Feed: gain was best (3.15) in 50g fed group and deteriorated with increasing level of concentrate supplementation. No significant effect of concentrate feeding was observed on carcass and gastrointestinal attributes. Digestibility of crude fiber and cellulose was affected by concentrate feeding with the highest value (40.4+or-2.4 and 49.3+or-2.9%) in the group 50g and the lowest value (29.9+or-4.1 and 42.7+or-1.0%) in the group fed *adlibitum*. It is concluded that for economical broiler rabbit production, the rabbits must not be fed more than 50g of concentrate per day incorporated with quality green fodder. Fifteen rabbits (10-12 weeks old) were divided into three groups. First group was fed solely on broom grass (T_1), second was offered 100% dried and ground broom grass (T_2) and a combination of 40% dried and ground broom grass with 60% concentrate was given to the last group (T_3) for a period of 105 days. It was concluded that broom grass can be fed to rabbits with advantage, only if it is processed (dried and ground) and mixed with concentrate mixture up to 40% level (Rohilla and Bujarbaruah, 2000).

2.6. Biochemical Changes by Kitchen Waste in Rabbit

Experiment on randomly selected sixteen grower rabbits between 10-12 weeks old conducted by Adefunke (2005)to evaluate the effect of utilizing newsprint waste (NPW) as replacement for maize on performance and hematological parameters of grower rabbits revealed that, there was significant ($p<0.05$) dietary effect on average daily weight gain which ranges between 9.17 and 14.52, feed intake (ranges from 2052.17 to 2581.63) and feed conversion ratio, the feedcost, total serum protein, glucose ranges from 52.7 to 114.90 and hematological parameters. The study concluded that, newsprint waste at 7.5% inclusion could be used as partial replacement for maize.

Another study conducted by Toghyani et al. (2010) revealed that inclusion of *M. puberula* leaf meal up to 30% dietary level would be of benefit in raising grower rabbit in the humid tropics because Hematological parameters such as PCV, RBC, Hb, MCV, MCH and MCHC were not significantly different among the treatment groups ($p>0.05$). Again serum biochemical constituents like urea, creatinine, cholesterol, sodium, chloride, bicarbonate and serum protein values were similar for all groups whereas potassium level was significantly ($p<0.05$) different among the treatment groups.

CHAPTER-III

MATERIALS AND METHODS

The experiment was conducted to study the replacement effects of roughage by kitchen waste on feed intake, growth performance and nutrient digestibility of crossbred New Zealand White (NZW) growing rabbit. The entire study includes collection of feed stuffs, chemical analysis, diet formulation, management and feedings of rabbits and growth and digestibility trial. The methodologies followed in this experiment are discussed in this chapter.

3.1. Location and Duration of Experiment

The present study was conducted in laboratory animal research unit, under the department of Animal Science and Nutrition at Chittagong Veterinary and Animal Sciences University. It was located at Chittagong region (lat 22°21'N, lon 91°49'E and elevation 95 ft) of Bangladesh. The average temperature was 25.1° C with a variation of ±8°C. The average annual relative humidity was 73.7%. This study was conducted for a period of eight (08) months (July 2015 to February 2016).

3.2. Experimental Design and Dietary Treatment Groups

A total of 45 weaned rabbits was procured from a market (Riazuddin Bazar) of Chittagong district of Bangladesh. All the rabbit were randomly divided into three treatment groups with similar average body weight (Table 3.1). Each treatment had three replications having 5 individuals in each replication following Completely Randomized Design (CRD). The three dietary treatments were T_1 (40 gram concentrate and *adlibitum* fodder), T_2 (40 gm concentrate and *adlibitum* road side grass) and T_3 (40 gm concentrate and *adlibitum* kitchen waste). All the rabbits were housed in iron cages (55cm x 40cm x 40 cm) during the entire experimental period. The rabbits had access to drinking water, green grass and concentrate feed that was offered twice daily, once in the morning at 8.00am and another in the afternoon at 4.00pm. Each rabbits was supplied 40 gm concentrate and *adlibitum* amount of roughage or kitchen waste as per treatment groups. The fodder offered to the experimental rabbits includes the mixture of Napier and Para grass. The concentrate mixture were formulated as per NRC (2000) using the available feed ingredients. Weekly body weight changes and daily feed intake of individual rabbit was monitored during the experimental period. Feed conversion ratio was estimated from dry matter intake and body weight gain.

Table 3.1: Initial mean live weight (in gm) of rabbits in different treatment groups:

Treatment groups	T_1	T_2	T_3
Body weight (Mean)	354.51	353.74	354.17

T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass and T_3= 40 gm concentrate and adlibitum kitchen waste.

3.3. Collection of Feedstuffs

Green grasses were collected from the fodder plot of Animal science and Nutrition Department, Chittagong Veterinary and Animal Sciences University and chopped prior to offer to rabbits. Maize, wheat bran, rice polish, pea bran, soybean meal, mustard oil cake, common salt and DCP plus was purchased from local market. The vegetable wastes were collected from kitchen, then washed and chopped. Then the feeds were offered to the rabbits according to the dietary treatment groups.

The concentrate mixture was formulated by mixing different feed ingredients in such a way to fulfill the nutrient requirement of growing rabbits (Table 3.2).

Table 3.2: Ingredient composition of concentrate mixture for growing rabbits

Ingredients	Amount (%)
Maize broken	52.50
Wheat bran	6.00
Rice polish	11.00
Pea bran	4.00
Mustard oil cake	3.00
Soybean meal	21.00
DCP	2.25
Salt	0.25
Total	**100**

Table 3.3: Proximate composition of supplied concentrate mixture

Parameters	Amount (%)
Dry Matter (DM)	88.00
Crude Protein (CP)	18.86
Crude Fibre (CF)	6.47
Ether Extract (EE)	6.02
Total Ash	4.62
Nitrogen Free Extracts (NFE)	64.03

Table 3.4: Proximate composition of green grass and kitchen waste

Parameters	Proximate Components (%)					
	DM	CP	CF	Ash	EE	NFE
Fodder (mixture of Napier and Para)	32	15.13	38.00	11.00	1.43	34.44
Roadside grass	30	15.24	35.00	12.00	1.44	35.13
Kitchen waste	31	16.17	39.00	10.50	1.39	34.11

3.4. Management Practices

The cages of rabbit along with all feeders and water pots were cleaned with clean water and then washed with washing powder and sun dried. The feeder and waterer were then placed inside the individual steel cage pens. All cages and floor of the room were cleaned with disinfectant every week. Normally floor was cleaned every day. Feeder and waterer were also cleaned everyday in the morning with water but these were cleaned with washing powder in every week. The faeces were taken away to a safe place in order to provide proper hygienic condition of the experimental shed. The rabbits of different treatment groups were provided with identical care and management throughout the experimental period.

3.5. Recording of Feed Intake

The rabbits were given with experimental diets; twice daily and left-over was collected on the next day. The refusal of concentrate feed of the subsequent days were collected, weighed and recorded in the following morning before offering feed. Feed intake was calculated after subtracting left-over from the feed supplied.

Feed consumption (g/rabbit) = Feed supply (g) – [Left over (g) + waste (g)]

3.6. Measurement of Live Weight, Live Weight Gain and FCR (Feed Efficiency)

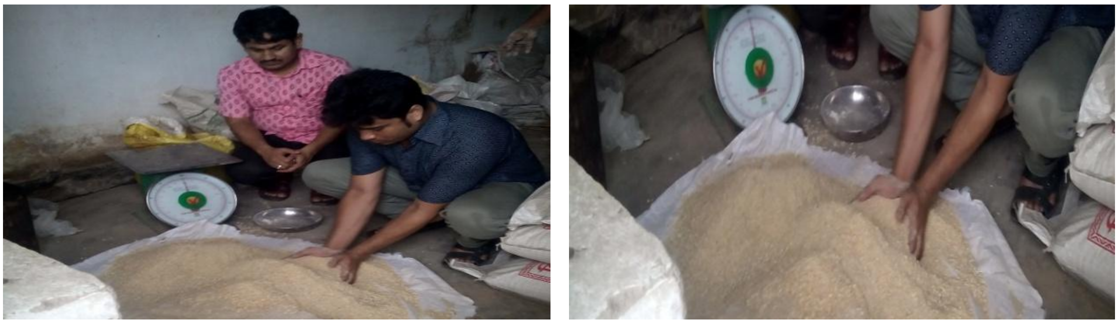
The rabbits were weighed individually at the beginning of the experiment and the average weight was taken as the initial body weight. Rabbits were weighed individually in every week by using an electric digital weighing balance before morning feeding. The weekly live weight gain was calculated by subtracting the weight at starting of the week from end of the week. The cumulative live weight was calculated by adding the weight at starting of the week with end of the week. Feed intake, FCR and live weight gain was also calculated according to the following formula based on dry matter of the supplied diets.

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Total feed intake (g)}}{\text{Live weight gain (g)}}$$

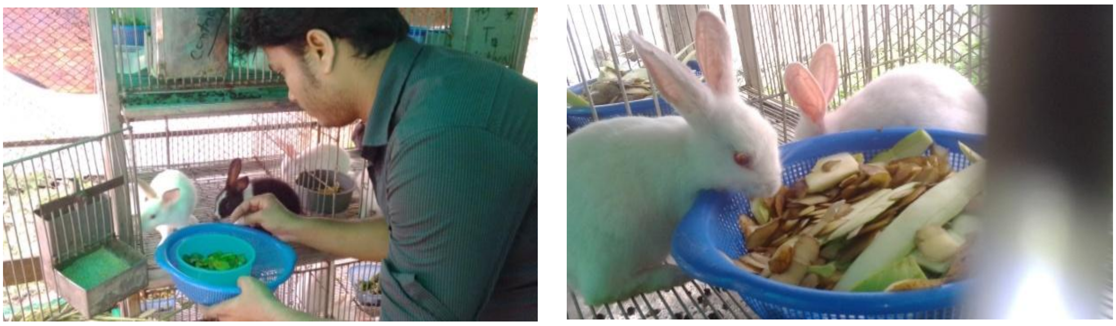
Weight gain for a particular week = (Final body weight of a particular week – Initial body weight of that particular week)

3.7. Livability of Rabbits

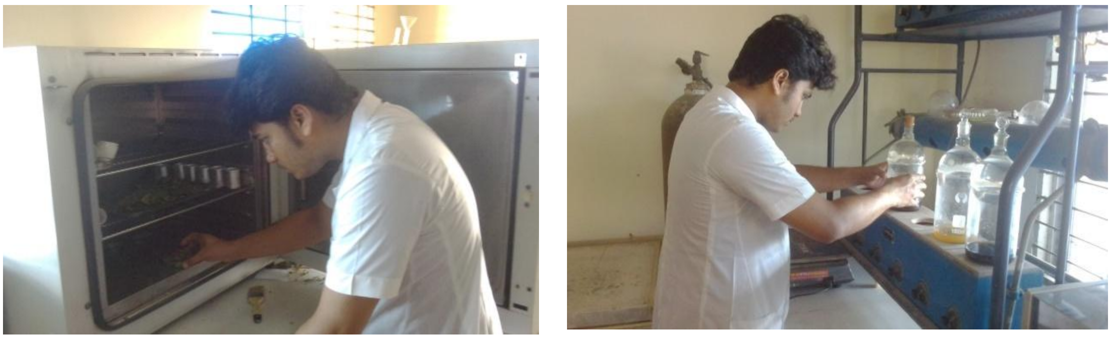
Each and every morning rabbit shed was visited and all rabbits were observed for any types of physical sickness. The livability of rabbit was calculated after deducting the dead one from the initial total and expressed as percent basis.



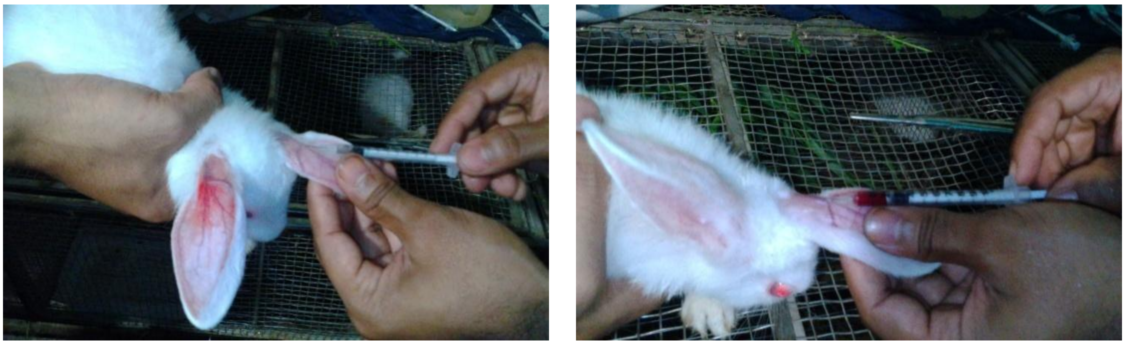
Picture 3.1: Preparation of Concentrate Mixture



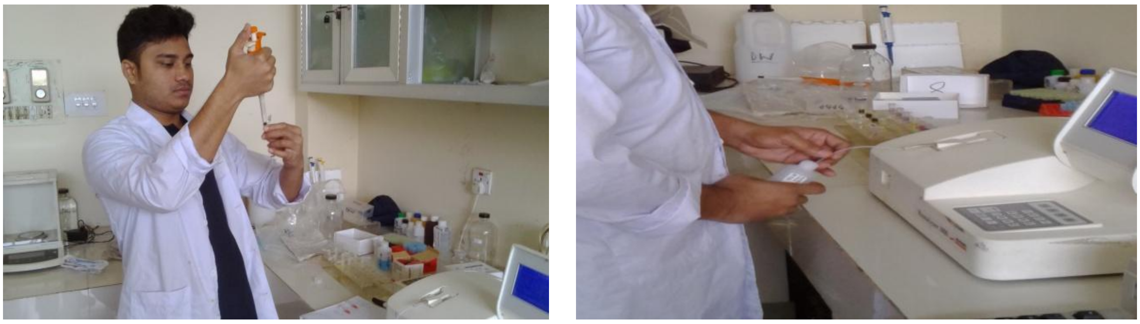
Picture 3.2: Feeding of Rabbit



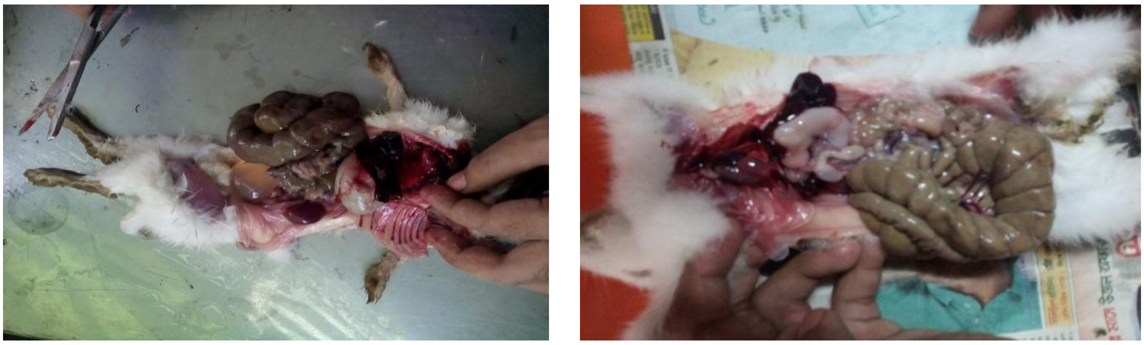
Picture 3.3: Proximate Analysis



Picture 3.4: Blood Collection From Ear Vein



Picture 3.5: Serological Analysis



Picture 3.6: Post-mortem Analysis of DeadRabbit

3.8. Digestibility Trial

A digestibility trial was conducted at the later part of the experimental period to evaluate the co-efficient of digestibility of nutrients of kitchen waste and other feed materials used in different treatment groups. Feed supply and feces collection were performed two times daily. During digestibility trial, the quantity of feed supplied and feces collected were recorded carefully. After collection of feces it was immediately stored in a freezer. Both the feed and feces were subjected to proximate analysis following the standard procedure (AOAC, 2004) to determine nutrient contents of feed and feces. Thedigestibility of each nutrient was estimated by the following formula.

$$\text{\% digestibility of Nutrient} = \frac{\text{Nutrient in feed (gm)} - \text{Nutrient in feces (gm)}}{\text{Nutrient in feed (gm)}} \times 100$$

3.9. Chemical Analysis

Samples of feed, feces and green grass were analyzed for moisture, crude protein(CP), crude fiber (CF), ether extract (EE), ash and nitrogen free extract (NFE) following the methods of AOAC(2004). All the samples were analyzed in duplicates and mean value were recorded carefully.

3.10. Collection and Preservation of Blood Samples

At the end of the feeding trial, 4 rabbits were selected from each treatment group, blood samples were collected through heart puncture and ear vein @ about 4ml from each rabbit. Blood sample was taken into two separate vials,one containing EDTA (anticoagulant) for hematology and the other was not contained anticoagulant which was used for serum preparation for biochemical analysis. The blood samples with anticoagulant were analyzed for Hemoglobin, Packed cell volume, Total erythrocyte count and Total leucocyte count within 24 hours of collection. The separated serum samples were preserved into deep freeze at -18 °C and biochemical analysis were done within 7 days.

3.11. Biochemical Analysis

The biochemical analysis was performed from the preserved serum sample. The samples were allowed to be in room temperature before starting the analysis. The serum total protein (TP), Albumin, Phosphorus, Calcium, Glucose, Urea, Creatinine and SGPT level were estimated by using biochemical analyzer (Humalyzer-3000 chemistry analyzer, semi automated Benchtop chemistry photometer, China) in biochemistry laboratory of CVASU. For each parameters the commercial kit of RANDOX Company (http://www.randox.com/reagent) were used and the manufacturer's procedure was followed.

3.12. Statistical Analysis

All collected data and sample evaluated values were imported in Microsoft office excel-2007 and transferred to SPSS-16 (Statistical Package for the Social Sciences) software for analysis. Descriptive statistics of some parameters were done. Quantitative performance parameters from different groups of dietary treatment, values of digestibility trial and hematological parameter were compared by one way ANOVA by using SPSS-16. The differences of different parameters were considered significant when the p- value was < 0.05 and highly significant when p – value was <0.01.

CHAPTER-IV

RESULTS

Results on replacement effect of roughage by kitchen waste on growth performances of rabbit along with other findings of the entire experiment are discussed chronologically in this chapter.

4.1. Replacement Effect on GrowthPerformance of Rabbit

4.1.1. Effect on Feed Intake

From the table 4.1 it was found that there was no significant (p>0.05) difference of mean weekly DM intake among treatment groups at 1^{st} week, 2^{nd} week and 3^{rd} week of the experiment. However, slightly higher numerical value in mean weekly DM intake was observed in T_3 group and lower mean weekly DM intake was found in T_1 group. At the third week of experiment, no negative effects were observed of kitchen waste supplementation on body weight of rabbit at their earlier age.

Table 4.1: Effects of different sources of roughage on weekly DM intake of rabbit

Age	Weekly DM intake (gm)				Level of significance
	T_1	T_2	T_3	SEM	
1^{st} week	352.81	352.94	353.18	0.30	NS
2^{nd} week	427.14	427.24	427.44	0.01	NS
3^{rd} week	449.45	449.62	449.83	0.01	NS

N=15; NS=Non-Significant (p>0.05); T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass; T_3= 40 gm concentrate and adlibitum kitchen waste.

4.1.2. Effect on Live Weight

From the table 4.2 it was found that mean body weight at first, second and third weeks of the trial almost similar and the average body weight of each group did not differ significantly (p>0.05). This trend persist up to the fourth week of the experiment, though numerically higher mean body weight was observed in T_1 group at the completion of the third week of experiment indicating no negative effects of kitchen waste on body weight of rabbit at their earlier age.

Table 4.2: Effects of different sources of roughage on body weight of rabbit

Age	Body weight (gm)				Level of significance
	T_1	T_2	T_3	SEM	
Initial	354.30	353.74	354.16	0.53	NS
1st week	425.86	425.40	425.04	0.65	NS
2nd week	561.88	560.80	561.34	1.04	NS
3rd week	728.63	727.10	727.52	1.03	NS

N=15; NS=Non-Significant (p>0.05); T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass; T_3= 40 gm concentrate and adlibitum kitchen waste.

4.1.3. Effect on Cumulative Body Weight

The mean cumulative body weight at first and second week of the trial seemed to be almost similar and the average body weight of each group did not differ significantly (p>0.05)(table 4.3). This trend persist up to the third week of the experiment, though numerically higher mean cumulative body weight was observed in T_1 group at the completion of the third week of experiment indicating no negative effects of kitchen waste on body weight of rabbit at their earlier age.

Table 4.3: Cumulative body weight of rabbit of different treatment groups

Age	Cumulative body weight (gm)				Level of significance
	T_1	T_2	T_3	SEM	
1st week	780.17	779.14	779.21	0.80	NS
2nd week	987.74	986.20	986.39	1.25	NS
3rd week	1290.51	1287.90	1288.86	1.55	NS

N=15; NS=Non-Significant (p>0.05); T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass; T_3= 40 gm concentrate and adlibitum kitchen waste.

4.1.4. Effect on Live Weight Gain

From the table Table 4.4 it was found that there was no significant difference (p>0.05)of mean live weight gain among all treatment groups at 1st week, 2nd week and 3rd week of the experiment. It indicates that there was no adverse effect of kitchen waste on the live weight gain of rabbit.

Table 4.4: Live weight gain in different week among various treatment groups

Age	Live weight gain (gm)				Level of significance
	T_1	T_2	T_3	SEM	
1st week	71.56	71.66	70.88	0.82	NS
2nd week	136.01	135.39	136.30	1.07	NS
3rd week	166.75	166.30	166.17	1.35	NS

N=15; NS=Non-Significant (p>0.05); T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass; T_3= 40 gm concentrate and adlibitum kitchen waste.

4.1.5. Feed Conversion Ratio (Feed Efficiency)

From the table 4.5 it was found that there was no significant (p>0.05) difference among the weekly FCR of rabbit among all treatment groups. However, the numerically better (slightly lower) FCR was found in T_1 group. It was also found that there was no significant (p>0.05) difference at 1st week, 2nd week and 3rd week data of mean FCR value in different treatment groups.

Table 4.5: Weekly Feed Conversion Ratio (FCR)

Period of experiment	Weekly FCR				Level of significance
	T_1	T_2	T_3	SEM	
1st week	4.94	4.94	4.99	0.05	NS
2nd week	3.14	3.16	3.14	0.02	NS
3rd week	2.70	2.71	2.71	0.02	NS

N=15; NS=Non-Significant (p>0.05); T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass; T_3= 40 gm concentrate and adlibitum kitchen waste.

4.1.6. Livability of Rabbits

The livability of rabbit was found as 96% in all the groups. The livability of rabbit was found as 98%, 94% and 98% in T_1, T_2 and T_3 groups respectively. The post-mortem examination was done after each death and found no pathologic lesions.

4.1.7. Digestibility Co-efficient of Different Nutrients

A digestibility trial was conducted at the last week of the experimental period. The digestibility co-efficient of dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), nitrogen free extract (NFE) and organic matter (OM) have been presented in table 4.6.

4.1.7.1. Digestibility Co-efficient of Dry Matter (DM)

The digestibility co-efficient of DM was found as 54.23, 62.24 and 63.45 percent respectively for T_1, T_2 and T_3 group (Table 4.6). The values varied from 54.23 to 63.45 percent. being highest in T_3 and lowest in T_1 group whereas the T_2 stands moderate in position. The result of statistical analysis of the value of digestibility of DM revealed the extremely significant ($P<0.05$) effect of treatment among the groups.

4.1.7.2. Digestibility Co-efficient of Crude Protein (CP)

The digestibility co-efficient of CP was found as 56.52, 63.53 and 62.31 per cent respectively for T_1, T_2 and T_3 group (Table 4.6). The values varied from 56.52 to 63.31 per cent being highest in T_2 and lowest in T_1 group whereas the T_3 stands moderate in position. The result of statistical analysis of the value of digestibility of CP revealed the extremely significant ($P<0.05$) effect of treatment among the groups.

4.1.7.3. Digestibility Co-efficient of Crude Fiber (CF)

The digestibility co-efficient of CF was found as 52.71, 52.75 and 56.47 per cent respectively for T_1, T_2 and T_3 group (Table 4.6). The values varied from 52.71 to 56.47 per cent being highest in T_3 and lowest in T_1 group whereas the T_2 stands moderate in position. The result of statistical analysis of the value of digestibility of CF revealed the extremely significant ($P<0.05$) effect of treatment among all groups.

4.1.7.4. Digestibility Co-efficient of Ether Extract (EE)

The digestibility co-efficient of EE was found as 56.50, 56.78 and 56.44% respectively for T_1, T_2 and T_3 group (Table 4.6). The values varied from 56.44 to 56.78% being highest in T_2 and lowest in T_3 group whereas the T_1 stands moderate in position. The result of statistical analysis of the value of digestibility of EE revealed the significant ($P<0.05$) effect of treatment among the groups.

4.1.7.5. Digestibility Co-efficient of Nitrogen Free Extract (NFE)

The digestibility co-efficient of NFE was found as 52.77, 56.71 and 56.42 per cent respectively for T_1, T_2 and T_3 group (Table 4.6). The values varied from 52.77 to 56.71 per cent being highest in T_2 and lowest in T_1 group whereas the T_3 stands moderate in position. The result of statistical analysis of the value of digestibility of NFE revealed the highly significant ($P<0.05$) effect of treatment among the groups.

4.1.7.6. Digestibility Co-efficient of Ash

The digestibility co-efficient of Ash was found as 54.26, 63.60 and 63.61 percent respectively for T_1, T_2 and T_3 group (Table 4.6). The values varied from 54.26 to 63.61 percent being highest in T_3 and lowest in T_1 group whereas the T_2 stands moderate in position. The result of statistical analysis of the value of digestibility of Ash revealed the extremely significant ($p<0.05$) effect of treatment among the groups.

4.1.7.7. Digestibility Co-efficient of Organic Matter (OM)

The calculated values of digestibility co-efficient of OM were found as 45.74, 36.40 and 36.39 per cent respectively for T_1, T_2 and T_3 group. The values varied from 36.39 to 45.74 per cent being higher in T_1 and lower in T_3 group according to their numeric values whereas the T_2 stands moderate in position. The digestibility co-efficient of nutrients have been presented in the table 4.6.

Table 4.6: Digestibility co-efficient of nutrients

Parameters	Nutrient digestibility of different treatment groups				Levelof significance
	T_1	T_2	T_3	SEM	
DM%	54.23^{c}	62.24^{b}	63.45^{a}	0.11	***
CP%	56.52^{c}	63.53^{a}	62.31^{b}	0.09	***
CF%	52.71^{b}	52.75^{b}	56.47^{a}	0.06	***
EE%	56.50^{ab}	56.78^{a}	56.44^{b}	0.08	*
NFE%	52.77^{c}	56.71^{a}	56.42^{b}	0.08	***
ASH%	54.26^{b}	63.60^{a}	63.61^{a}	0.13	***
OM%	45.74^{a}	36.40^{b}	36.39^{b}	0.10	***

*N=15; SEM=Standard Error of Mean; NS=Non-Significant (p>0.05); *=Significant (P<0.05); **=Significant (P<0.01); (a,b,c,..) Means with different superscripts in the same row differ significantly (p> 0.05). T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass; T_3=40 gm concentrate and adlibitum kitchen waste.*

4.2. Replacement Effect of Roughage by Kitchen Waste on Biochemical Parameters of Rabbit

The blood sample was collected from ear vein and through heart puncture at the last day of the digestibility trial four (04) rabbits from each treatment groups. The blood serum biochemical parameters of experimental rabbits have been presented in the table 4.7.

4.2.1. Biochemical Changes

Table 4.7: Effect of kitchen waste on serum biochemical parameter of rabbits (n=4).

Parameters	Serum biochemical parameter of rabbits				Level of significance
	T_1	T_2	T_3	SEM	
Protein (g/dl)	4.53^c	5.38^b	6.56^a	0.06	***
Albumin (g/dl)	9.10^c	9.88^a	9.52^b	0.04	***
Phosphorus (mg/dl)	6.53^c	10.17^a	9.95^b	0.07	***
Calcium (mg/dl)	6.11^c	11.93^b	11.94^a	0.07	***
Glucose (mg/dl)	131.80^c	196.46^b	198.73^a	0.89	***
Creatinine (mg/dl)	0.783^a	0.446^b	0.446^b	0.02	***
Urea (mg/dl)	33.50^c	55.42^b	57.31^a	0.38	***
SGPT (u/l)	45.01^c	53.47^b	55.15^a	0.51	***

*N=4; SEM=Standard Error of Mean; NS=Non-Significant (p>0.05); *=Significant (P<0.05); **=Significant (P<0.05); (a,b,c,..) Means with different superscripts in the same row differ significantly (p> 0.05). T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass; T_3=40 gm concentrate and adlibitum kitchen waste.*

4.2.1.1. Serum Protein Value

From the above table (Table 4.7) it was found that total protein level in serum of T_1, T_2 and T_3 groups were 4.53, 5.38, and 6.56 g/dl respectively. The comparison of means of statistical analysis revealed that highly significant (p< 0.05) effect of feed on serum protein was observed having higher in T_3 and lower in T_1 group.

4.2.1.2. Serum Albumin Value

From the above table (Table 4.7) it was observed that Albumin level in serum of T_1, T_2 and T_3 groups were 9.10, 9.88, and 9.52 g/dl respectively. The comparison of means of statistical analysis revealed that highly significant (p< 0.05) effect of feed on serum albumin was observed having higher in T_2 and lower in T_1 group.

4.2.1.3. Serum Phosphorus Value

From the above table (Table 4.7) it was observed that Phosphorus level in serum of T_1, T_2 and T_3 groups were 6.53, 10.17, 9.95 mg/dl respectively. The comparison of means of statistical analysis revealed that highly significant ($p< 0.05$) effect of feed on serum Phosphorus was observed having higher in T_2 group and lower in T_1 group.

4.2.1.4. Serum Calcium Value

From the above table (Table 4.7) it was observed that total calcium level in serum of T_1, T_2 and T_3 groups were 6.11, 11.93, 11.94 mg/dl respectively. The comparison of means of statistical analysis revealed that highly significant ($p< 0.05$) effect of feed on serum calcium was observed having higher in T_3 and lower in T_1 group.

4.2.1.5. Serum Glucose value

From the above table (Table 4.7) it was revealed that glucose level in serum of T_1, T_2 and T_3 groups were 131.80, 196.46, 198.73 mg/dl respectively. The comparison of means of statistical analysis revealed that highly significant ($p< 0.05$) effect of feed on serum glucose was observed having higher in T_3 and lower in T_1 group.

4.2.1.6. Serum Creatinine Value

From the above table (Table 4.7) it was observed that Creatinine level in serum of T_1, T_2 and T_3 groups were 0.783, 0.446, 0.446 mg/dl respectively. The comparison of means of statistical analysis revealed that highly significant ($p< 0.05$) effect of feed on serum Creatinine was observed having higher in T_1 and lower in both T_3 and T_2 group.

4.2.1.7. Serum Urea Value

From the above table (Table 4.7) it was found that urea level in serum of T_1, T_2 and T_3 groups were 33.50, 55.42, 57.31 mg/dl respectively. The comparison of means of statistical analysis revealed that highly significant ($p< 0.05$) effect of feed on serum urea was observed having higher in T_3 group and lower in T_1 group.

4.2.1.8. Serum Glutamic- Pyruvic Transaminase Values (SGPT value)

From the above table (Table 4.7) it was observed that SGPT level in serum of T_1, T_2 and T_3 groups were 45.01, 53.47, 55.15 u/l respectively. The comparison of means of statistical analysis revealed that highly significant ($p< 0.05$) effect of feed on serum SGPT was observed having higher in T_3 and lower in T_1 group.

4.3.Cost-benefit analysis

In case of cost analysis, Rabbit cost, total feed cost, management cost and finally total cost were calculated in Taka per Rabbit. Total feed cost included to feed raw materials cost. Management cost included labour cost, electricity cost, disinfectant cost. In case of return, market sale price, total sale price and net profit were calculated in Taka per Rabbit.

Table 4.6.1: Cost of production and returns in different treatment groups

Parameters	Cost items T_1 Mean±SEM	T_2 Mean±SEM	T_3 Mean±SEM	Level of significance
Rabbit.cost (Tk./Rabbit)	200.00	200.00	200.00	NS
Total feed cost(Tk./Kg)	36.06	35.15	30.70	**
Management cost (Tk./Rabbit)	17.00	17.00	17.00	NS
Total. Feed cost(Tk./Rabbit)	82.88^{a}±0.03	80.33^{b}±0.14	76.40^{c}±0.10	**
Total Cost (Tk./ Rabbit)	170.90^{a}±0.03	169.0^{b}±0.09	146.5^{c}±0.15	**
Total Cost (Tk./Kg.live Rabbit)	129.25^{a}±0.46	127.74^{b}±0.25	120.35^{c}±0.78	**

N=15; NS=Non-Significant (p>0.05); T_1= 40 gram concentrate and adlibitum fodder, T_2= 40 gm concentrate and adlibitum road side grass; T_3= 40 gm concentrate and adlibitum kitchen waste.

Income				
Market sale price (Tk./Kg Rabbit)	417	417	417	NS
Total sale price (Tk./Rabbit)	410.23[a]±0.72	405.81[c]±0.81	408.85[b]±0.71	**
Net Profit (Tk./ Rabbit)	80.33[a]±0.71	78.8[c]±0.69	85.3[b]±0.58	**
Net Profit (Tk./Kg live Rabbit)	6.75[b]±0.24	5.86[c]±0.16	8.65[a]±0.78	**

*Mean values having uncommon superscripts differ significantly, SEM = Standard error of mean, NS = Non significant, * = significant at 5% level,** = significant at 1% level*

N.B. Total feed cost included feed raw materials cost and management cost included, labour cost, electricity cost, disinfectant cost.

1 US $=78 Taka (approx.)

CHAPTER-V

DISCUSSION

Rabbit rearing may be a subsidiary or sometime poor income generating source for rural families, marginal farmers, children, landlesslaborer and distress women. In Bangladesh perspective to meet up the daily protein demand rabbit meat might be put a good impact. Rabbit is an herbivorous animal so feeding kitchen waste would be more economic. The present study has been conducted to know whether rabbit can be reared by feeding kitchen waste as a replacement feed of roughage by comparing daily and weekly body weight gain, feed conversion ratio, nutrient digestibility, and serum biochemical profile. This section of the thesis has discussed important findings of the current study along with limitations, conclusions and recommendations.

5.1.Replacement Effect of Roughage by Kitchen Waste on Growth Performances of Rabbit

5.1.1. Growth and FCR

From the data on table 4.1 to 4.4, it was found that there was no significant ($p>0.05$) difference of mean weekly DM intake, live weight, cumulative body weight, live weight gain and feed conversion ratio among all treatment groups of rabbit in the entire experimental period. The results on these parameters of the experiment indicated that there is no negative effect of kitchen waste on growth performances of rabbit up to its market age. So the rabbit can be reared feeding kitchen waste which is corroborated with many earlier studies conducted by Lukefahr and Goldman (1985); (Nakkitset et al., 2008).

5.1.2. Digestibility Co-efficient

A digestibility trial was conducted at the last week of the experimental period. The digestibility co-efficient of dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), nitrogen free extract (NFE) and organic matter (OM) was presented in table 4.6 and were depicted in figure 4.2. After analyzing the value of the co-efficient of digestibility of different nutrients in rabbit, it was found that the mean digestibility of all the proximate components revealed the extremely significant ($P<0.05$) effect of treatment among all groups having higher in T_3 in most of the components and lower in T_1 in all components. From this findings, it can be said that the kitchen waste have the potentials to be digested smoothly by rabbit as compared to the other roughages when supplemented with 40% concentrate mixture in the ration. This statement was also supported by Lukefahr and Goldman (1985) and Nakkitset et al. (2008) where they used different kitchen vegetable residues like water spinach or sweet potato wines, lettuce residues etc as well as kitchen crop residues like damaged bananas, mangoes or other fruits to rabbit as a feed supplement and observed the same result.

5.1.3. Overall Growth Performances

The findings of the current study was also supported by some other researchers who told that feeding of non-conventional kitchen waste diets might be supplemented to rabbit in compared to the regular diet based control group (Onu and Aja, 2011). The work was supported by researcher in other study (Mostofa et al., 2007) who reported non-conventional feed like garlic sometimes may increase the weight gain of rabbits and broilers as well. Current study was also agreed with Farinu (2010), who had used non-conventional feed as supplemented feed ingredients for broiler rabbit.

5.2. Replacement Effect of Roughage by Kitchen Waste on Serum Biochemical Changes of Rabbit

It was revealed that total protein, calcium, glucose, urea, and SGPT level in serum was significantly higher in T_3 group of rabbit where 40 gm concentrate and *adlibitum* kitchen waste was offered as compared to theT_2 group where 40 gram concentrate and *adlibitum* fodder was offered to rabbit. It was also found that serum albumin level was significantly ($P<0.05$) differed among different treatment groups where highest value was found in T_2 group where 40 gm concentrate and *adlibitum* road side grass was offered and lowest was in T_1 group where 40 gram concentrate and adlibitum fodder was offered. Highest phosphorus level was found in T_2 group where 40 gm concentrate and *adlibitum* road side grass was offered and lowest found in T_3 group where 40 gm concentrate and *adlibitum* kitchen waste was offered. Highest creatinine level found in T_1group and lowest level found in group T_3 and T_2. Further, the protein percent in T_1 group was slightly lower in respect to the normal range which might be due to the less CP% in feed of T_1 group. Again the protein percent in T_2 and T_3 group was within the normal protein value whereas T_3 was near the maximum normal blood protein level which might be due to the presence of high CP% in kitchen waste. This study suggested that theinclusion of kitchen waste would be of benefit in raising grower rabbit in this country perspective. However, the findings regarding the serum biochemical changes of the current study was corroborated with the findings of (Adefunke, 2005) and (Toghyani et al., 2010) in each and every aspects. Hence, it can be said that addition of kitchen waste as a sole source of roughage may have no detrimental effect on growth performances of rabbit.

CHAPTER-VI

CONCLUSION

The experiment was conducted at the Animal Nutrition Laboratory, Chittagong Veterinary and Animal Sciences University for a period of eight (08) month to study the replacement effect of roughage by kitchen waste on growth performances, nutrient digestibility and feed conversion efficiency of crossbred New Zealand White (NZW) growing rabbit. To conduct this experiment forty five (45) weaned crossbred New Zealand White (NZW) growing rabbits (aged about 40-50 days) were divided into three dietary treatment groups each having three replications and fed with adlibitum fodder (T_1), road side grass (T_2) and kitchen waste (T_3) along with 40 gm concentrate mixture in each treatment organized in a Completely Randomize Design (CRD).

The experiment was conducted at the Animal Nutrition Laboratory, Chittagong Veterinary and Animal Sciences University for a period of eight (08) month to study the replacement effect of roughage by kitchen waste on growth performances, nutrient digestibility and feed conversion efficiency of crossbred New Zealand White (NZW) growing rabbit. To conduct this experiment forty five (45) weaned crossbred New Zealand White (NZW) growing rabbits (aged about 40-50 days) were divided into three dietary treatment groups each having three replications and fed with adlibitum fodder (T_1), road side grass (T_2) and kitchen waste (T_3) along with 40 gm concentrate mixture in each treatment organized in a Completely Randomize Design (CRD).

Final body weight and weekly body weight gain and cumulative body weight gain was not differed significantly among all the treatment groups. The result indicated that replacement effect of roughage by kitchen waste had no detrimental effect on final body weight and body weight gain as well as on growth parameters of growing rabbit. The result of the experiment also clearly indicated that feeding 40 gm concentrate and *adlibitum* road side grass and 40 gm concentrate and *adlibitum* kitchen waste had no significant effect on FCR. Though 40 gm concentrate and adlibitum kitchen waste group showed numerically better FCR value followed by 40 gram concentrate and *adlibitum* fodder diet, and 40 gm concentrate and *adlibitum* road side grass, they are not differed significantly. In contrast, the digestibility coefficient of different nutrients (DM, CP, CF, Ash and NFE) in rabbit, the mean digestibility of all the proximate components was differed significantly among all treatment groups which were higher in T_3 for most of the components and lower in T_1 for all components. However, the DM digestibility was higher in T_3 group where 40 gm concentrate and *adlibitum* kitchen waste were offered compared to other two groups of treatment. Whereas, CP digestibility was higher in 40 gram concentrate and *adlibitum* fodder group compared to other two treatments. From this findings, it can be said that the kitchen waste have the potentials to be digested smoothly by rabbit as compared to the other roughages when supplemented with 40% concentrate mixture in the ration.

In the serum biochemical study, the values of Total protein, Albumin, Phosphorus, Calcium, Glucose, Creatinine, Urea and SGPT result showed significant difference among the treatment groups.

Finally the study showed that kitchen waste could efficiently be fed to rabbit to increase its growth and biochemical performances on the basis of cost and availability. Finally it can be recommended that kitchen waste may be the suitable alternative to rear growing rabbit where it can be supplemented with 40 gm of concentrate mixture for economic production.

CHAPTER-VII

RECOMMENDATION

This study on the investigation of the replacement effect of roughage by kitchen waste on growth performances of rabbit suggests the following recommendations:

The replacement of roughage based diet by kitchen waste showed more or less same body weight gain, effective outcome in FCR and Feed intake. So, farmers can replace roughage based diet by kitchen waste in rabbit ration for reducing cost of ration with better digestibility and growth of rabbit. However, Rabbit was very sensitive animal so proper care and hygiene should be maintained for better performances of rabbit. Furthermore, properly clean and chopped kitchen waste should be offered twice daily.

FUTUREPERSPECTIVE

The current study only indicates replacement of roughage by kitchen waste and duration of experimental trial was not sufficient enough to draw final conclusion regarding the seasonal effect on growth parameters. However, only kitchen waste was included in the study, further research can be done on fruit waste like mango peel, banana peel, guava peel, tree leaf and other fruits waste etc to see the growth performance of rabbits. The meat composition was not studied in this study so further study could include the meat composition effects by replacing roughage with kitchen waste in rabbit ration.

CHAPTER-VIII

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Annexure 1: Serum Biochemical Study

Blood urea estimation:

Principal: Urea reacts with diacetylmonoxime in acidic conditions at nearly 100^oC to give a red coloured product which is measured colorimetrically at 520nm. Thiosemicarbazide and ferric ions are added to catalyse the reaction and increase the intensity of colour. This method is linear only upto 300mg% urea. For higher values if expected, the blood sample should be diluted.

Reagents

1) Reagent A: Dissolve 5g of ferric chloride in 20ml of water. Transfer this to a graduated cylinder and add 100ml of orthophosphoric acid (85%) slowly with strring. Make up the volume to 250ml with water. Keep in brown bottle at 4oC.
2) Reagent B: Add 200 ml conc, H_2SO_4 to 800 ml water in 2L flask slowly with stirring and cooling.
3) Acid Reagent: Add 0.5 ml of reagent A to 1 L of reagent B. keep in brown bottle at 4^oC.
4) Reagent C :Diacetylmonoxime 20g/L of water. Filter and keep in brown bottle at 4^oC.
5) Reagent D :Thiosemicarbazide 5g/L of water.
6) ColourReagent : Mix 67 ml of C with 67 ml of D and make up the volume to 1000 ml with D.H_2O keep in brown bottle at 4^oC.
7) Stock urea standard : 100mg/100 ml water.
8) Working urea standard : Dilute 1 ml stock to 100ml with DH_2O so conc. is 1 mg/100ml.

Procedure: 0.1 ml if serum/plasma is diluted to 10 ml. set up the test tubes as follows:

		B	T	S1	S2	S3	S4	S5
Serum (ml) (dil 1:100)		-	1.0	-	-	-	-	-
Std (ml)		-	-	0.2	0.4	0.6	0.8	1.0
D. Water (ml)		2	1.0	1.8	1.6	1.4	1.2	1.0
Colour Reagent (ml)	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Acid reagent (ml)	2.0		2.0	2.0	2.0	2.0	2.0	2.0

Mix all the tube thoroughly. Keep in boiling water bath for exactly 30 mins. Then cool and read absorbance at 520nm.

Estimation of Total Protein:

Principle : Cupric ions form chelates with the peptide bonds of proteins in an alkaline medium. sodium potassium tartrate keeps the cupric ions in solution. The intensity of the violet colour that is formed is proportional to the number of peptide bonds which, in turn, depends upon the amount f proteins in the specimen.

Reagents:

(i) Biuret Reagent – 3 mg of copper sulphate is dissolved in 500 ml of water. 9 gm of sodium potassium tartrate and 5 gm of potassium iodide are added and dissolved. 24 gm of sodium hydroxide, dissolved separately in 100 ml of water is added. The volume is made up to 1 litre with water. The reagent is stored in a well-stoppered polythene bottle.

(ii) Biuret blank – this is prepared in the same way as the bi uret reagent with the difference that copper sulphate is not added.

(iii) Standard protein solution – the best way is to determine the total protein concentration in pooled human serum by Kjeldahl method, dilute it to bring the protein concentration to the desired level, say 6 gm/100 ml and use it as standard. Alternatively, a 6 gm/100 ml solution of bovine albumin in water may beprepared and used as standard.

Procedure: label 3 test tubes 'Unknown', 'Standard' and 'Blank', Measure 5 ml of biuret reagent into each. Wash 0.1 ml of serum into 'Unknown', 0.1` ml of standard protein solution into ';Standard' and 0.1 ml of water into 'Blank'. Mix and allow to stand for 30 minutes.

Read 'Unknown' and 'Standard' against 'Blank' at 540 nm or using a green filter.

Calculations:

$$\text{Serum total protein(gm/dl)} = 6 \times \frac{Au}{As}$$

Estimation of serum Albumin:

Bromocresol Green Method:

Principle: The method is based on the protein error of indicators. Biding of a protein to an indicator changes its colour. Among serum proteins, only albumin binds to BCG this binding produces a change in the colour of BCG which is measured colorimetrically. The pH is maintained during the reaction by a buffer.

Reagents

(i) Succinate buffer - 11.8 gm of soccinic acid is dissolved in about 800 ml of water. The pH is adjusted to 4.0 with 0.1 N sodium hydroxide. The volume is made up to 1 litre with water. This solution should be stord in refrigerator.

(ii) BCG solution - 419 mg of bromocresol green is dissolved in 10 ml of water. The solution is stored in refrigerator.

(iii) Buffered BCG solution – 250 ml of BCG solutions is mixed with 750 ml of succinate buffer. The pH is adjusted to 4.2 with 0.1 N sodium hydroxide solution. 4 ml of Brij – 35 solution (30%) is added.

(iv) Standard albumin solution – an aqueous solution of human albumin with a concentration of 4 gm/100 ml can be prepared and used as a standard. Sodium azide should be included in this solution (50 mg in every 100 ml) as a preservative. Pooled human serum (preserved with sodium azide) or a control serum having an albumin concentration of 4 gm/100 ml can also be used as a standard.

Procedure: Level 3 test tubes 'Unknown', 'Standard' and 'Blank'. Measure 4 ml of buffered BCG solution into each. Wash 0.02 ml of serum into 'Unknown', 0.02 ml of standard albumin solution into 'Standard' and 0.02 ml of water into 'Blank'. Mix and allow the tubes to stand for 5 minutes.

Read 'Unknown' and 'Standard' against 'Blank' at 630 nm or using a red filter.

Calculations:

Serum Albumin(gm/dl)= $4 \times \frac{Au}{As}$

Estimation of serum cholesterol:

Test Principle: The cholesterol is determined after enzymatic hydrolysis and oxidation. The indicator quinoneimine is formed from hydrogen peroxide and 4-aminoantipyrine in the presence of phenol and peroxidase.

Procedure:

Both reagent and sample brought at room temperature and mixed 1.0 ml reagent with 10µl sample in test tube. Let waited for 10 minutes and placed mixture in cuvette. The cuvette was sated in spectrophotometer at 550 nm and recorded the reading. The reading was calculated by comparing with standard value and multiplied by 200mg/dl. So the result was expressed as mg/dl.

Estimation of serum creatinine:

Before performing the test, the “Reflotron” instrument was switched on when “Ready” appears on the display, argalment carrier strip out of the wall was taken and the vial was closed immediately with the desiccant stopper. The foil was removed protecting the test area; taking could not too overhead the strip. By using “Reflotron pipette, the sample material was drawn up (0.3 ml) avoiding the formation of bubbles and applied that as a drop the centre of the red application zone without allowing the pipette tip to touch the zone. Within 15 seconds, the flap was opened; the strip was placed on the guide and inserted the strip horizontally into the instrument until hearing a click. Closing flap the display “creatinine” confirmed that the rest specific magnetic code has been correctly read into the instrument. The time before the results appeared in displayed in seconds. After particular time, the creatinine concentration displayed in for mg/dl 37ºC, 30ºC depending upon the reference temperature selected. The range of measurement was 5.00-500 mg/dl, (37ºC).

Annexure 2: Nutrient composition of feed (concentrate)

Nutrient composition of feeding ingredients used for concentrate mixture(NRC, 1977)

Ingredients	DM (%)	CP (%)	CF(%)	EE (%)	Ca(%)	P (%)	ME (Kcal/KG)
Maize	89.50	8.30	2.90	4.60	0.13	0.21	3350
Ricepolish	92.45	14.12	4.10	11.00	0.05	1.31	3100
Wheatbran	88.3	14.50	7.40	4.80	0.18	0.92	1300
Peabran	88.6	17.67	23.78	1.01	-	-	1812
Soybeanmeal	89.7	46.58	6.25	1.10	0.29	0.58	2230
Mustard oil cake	92.70	33.90	6.20	5.50	2.00	0.30	2200
DCP	0.99	_	_	_	28.00	37.34	_

Annexure 3:The nutritive value of green grass

Nutrients	(%)
DM	20.00
CP	14.24
CF	34.8
EE	1.435
NFE	38.005
Ash	11
*Ca	0.01
*p	0.02
*ME (Kcal/kg DM)	1000

*According to NRC(1977)

Annexure 4: Market price of different feeding ingredients used in the experiment(as on 1st August 2015)

Name of ingredients	Price of ingredients (TK/kg)
Maize	26
Ricepolish	24
Pea bran	45
Wheatbran	32
Soybeanmeal	50
Mustardoilcake	45
CommonSalt	14
Vit c	100/100gm pack
DCP	100
Choline chloride	275/750ml

BRIEF BIOGRAPHY

This is DR. Amith Kumar Dash; son of Bikorn Kumar Dash and Ela Rani from KhoksaUpazilla under Kushtia district of Bangladesh. He has passed the secondary school certificate examination in 2005 followed by higher secondary certificate examination in 2007. He obtained his Doctor of Veterinary Medicine Degree in 2012 (held in 2014) from Chittagong Veterinary and Animal Sciences University (CVASU), Bangladesh with CGPA 3.36 (out of 4.00). Now, he is a candidate for the degree of MS in Animal and Poultry Nutrition under the Department of Animal Science and Nutrition, Faculty of Veterinary Medicine, CVASU.