International Journal of Agriculture Sciences
ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 11, Issue 6, 2019, pp.-8100-8102.
Available online at https://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

# EFFECT OF DIFFERENT HOUSING SYSTEMS ON FEED CONVERSION RATIO, HAEMATOBIOCHEMICAL PARAMETERS AND COCCIDIAL OOCYST OF BROILER RABBITS

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Received: March 15, 2019; Revised: March 25, 2019; Accepted: March 26, 2019; Published: March 30, 2019

**Abstract:** The present investigation was conducted to study the effects of different housing systems on growth performance, feed consumption, morbidity and mortality of broiler rabbits in semi arid region of North Gujarat. Total 24 weaned rabbits (28 days age) were randomly divided in two housing treatments, T1 (Cage housing) and T2 (Deep litter housing system). The duration of experiment was 8 weeks. Weekly observations were recorded for weight gain. The data generated were analysed for significant differences. The mean FCR was numerically higher in T2 (3.9±0.60) than the T1 (3.8±0.830). The results indicated that FCR were at par in the cage and deep litter system of housing. The mean serum glucose (mg/dl) was higher in T2 (150.8 ± 8.879) as compared to T1 (138.0 ± 7.920), whereas the mean serum triglyceride (mg/dl) was higher in T1 (93.87 ± 16.41) than T2 (73.35 ± 13.14). The results indicated that there was no significant variation in blood biochemical parameters of rabbit in the cage and deep litter system of housing. No any coccidial oocysts were found in the any of the group.

**Keywords:** Rabbit, Housing, Feed Conversion, Haematobiochemical, Coccidia

**Citation:** Prajapati R.K., *et al*., (2019) Effect of Different Housing Systems on Feed Conversion Ratio, Haematobiochemical Parameters and Coccidial Oocyst of Broiler Rabbits. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 11, Issue 6, pp.- 8100-8102.

**Academic Editor / Reviewer:** Dr Akash Thakor, Dr Bhavesh Pandor, Dr Ritesh Shinde

## Introduction

The rabbit (*Oryctolagus cuniculus*) known as "Micro-Livestock" can be a great source of food production [2]. In the United Kingdom, rabbits are the third most popular pet after cats and dogs [8]. Rabbit belong to the order lagomorpha, which has two families (leporidae and ochotonidae) that comprise 12 genera. There is a great opportunity of rabbit farming and commercial production which can be a great source of income and employment because rabbits need small place for living and less food for surviving. Rabbit meat is very tasty, nutritious and easily digestible for all and aged people too which contains high amount of protein, energy, calcium and vitamins than any other types of animal meat along with that the amount of cholesterol, fat and sodium is also less than other meats [6]. Among the food animals pigs and rabbits are considered as the litter bearing animals which can help to meet the increasing demand for meat [7] carried out a survey on world rabbit meat production and reported that India has 36,700 females producing 750 tonnes of rabbit meat with a per capita consumption of 90 g/day. France, UK and Germany are the biggest importer of rabbit meat. France is producing approximately 2.50 Lakh ton of rabbit meat annually with per capita availability of 5 kg/year. Among the eastern European countries, Hungary is the biggest producer of rabbit meat and they normally export it to Italy. Among the Asian countries China is the biggest producer and exporter of rabbit meat [14]. China is the largest producer accounting for more than 462 million rabbits or 40% of global production [11]. Venezuela is the second and Italy is the world third largest rabbit producer having about 150 million rabbits [11]. Among the developed countries, INRA (Institute for Natural Resources in Africa) and FAO surveyed 64 developing countries to identify the potentialities of rabbit production in the developing countries and stated that India is facing meat shortage of 4.66 g/day/person against the recommended requirement of 87 g / day [10].

Wire cage housing for rabbits is considered most economical and is more widespread [13], although each housing method has its advantages and disadvantages. When kept on straw bedding, rabbits have a warmer lying area, there is a lower influence of outside temperatures, yet constant contact with the manure increases the risk of coccidiosis. Currently practised rabbit housing technologies should be revised by paying greater attention to animal welfare–space requirement per rabbit, cage height requirements and environment enrichment, such as platforms or hiding places for rabbits. One of the solutions to the problem is changing of the cage design by making all or part of the cages higher. Housing systems should be efficient in environmental thermoregulation to insure better rearing through good biological performance, thus high economic return. Housing for livestock is designed to suit the prevailing climatic conditions, bearing in mind the availability and cost of materials, local construction workers skills when thermal stress would negatively influence animal welfare and productivity.

## Materials and Methods

The study was conducted at Rabbit Unit, Instructional Livestock Farm Complex, Department of Livestock Production and Management, College of Veterinary Science and Animal Husbandry, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. All the experimental rabbits were reared with does till 4$^{th}$ week of age and after that weaning were done and they were distributed randomly into 2 treatment groups as per the technical plan of investigation. The treatment groups were made by keeping rabbits in cage and deep litter. In one cage of 3 × 2 × 2 feet, maximum 3 experimental rabbits were kept. Door of the cage was rear side of cage and cage was kept 2 feet high on the metal stand from the floor.

In Deep litter house the wall was prepared by red bricks and height was 2.5 feet: deep litter material of wheat straw was spread of 5 cm thickness. Floor of deep litter housing was made using Kota stone. In deep litter system 2 square feet floor space (minimum) was provided to each rabbit. All the rabbits were weighed individually with electronic weighing balance in morning before offering feed and water and that was taken as initial body weight of rabbits. All possible measures were strictly followed to maintain standard and uniform manage mental conditions to all the experimental rabbits throughout the experimental period. Room temperature was almost in the range of 18-25ºC throughout the experimental period. Experimental rabbits were offered, measured amount of concentrate and fresh vegetables, while green fodder and clean and fresh drinking water was provided ad libitum to all experimental rabbits. The water bowls were being washed daily and then filled with cool fresh water frequently as to avoid the heat stress. The rabbits were protected against various diseases by taking strict sanitary measures and routine cleaning and washing of feeding and watering utensils. Faecal samples were examined at monthly interval (at 8th and 12th week of age) for parasitic infection (coccidial oocyst) in the department of veterinary parasitology using sedimentation method for diagnosis of parasitic eggs. The data were analyzed using standard statistical procedures for mean comparison of differences between treatment groups by T-test as described by [15]. Blood samples were randomly collected from 6 rabbits from each treatment group at the end of experimental period (12 week age) and analyzed for cholesterol, triglyceride and glucose level by diagnostic kit.

## Results and Discussion

### Feed Conversion Ratio

Feed conversion ratio is obtained by dividing average feed consumed (g) to the average body weight gain (g). Lower FCR is preferable because it denotes better feed conversion efficiency. The average feed conversion ratio recorded from 5th week to 12th week has been presented in [Table-1]. The feed conversion ratio was found higher during the 5th, 8th, 9th and 12th in deep litter housing system then cage housing system. The feed conversion ratio during 6th, 7th and 10th week was found higher in cage housing system followed by deep litter housing system. The feed conversion ratio during 11th week (FCR11) was similar in both cage housing system and deep litter housing system. Overall, results revealed that the difference in average feed conversion ratio due to treatment was not significant. The feed conversion ratio (FCR5-12) was the higher for deep litter housing system (3.9 ± 0.6) then cage housing system (3.8 ± 0.8). Cage housing system (T1) is less efficient in feed conversion than deep litter housing system (T2). The findings are in agreement with the earliest findings [24].

Table-1 *Average feed conversion ratio of broiler rabbits at different age*

| Age in weeks | Cage housing system ($T_1$) | Deep litter housing system ($T_2$) |
|---|---|---|
| 04-May | 1.7 | 1.8 |
| 05-Jun | 2.3 | 2.3 |
| 06-Jul | 3.3 | 3.1 |
| 07-Aug | 2.8 | 3.2 |
| 08-Sep | 3.7 | 4 |
| 09-Oct | 4.6 | 4.2 |
| 10-Nov | 5.9 | 5.9 |
| 11-Dec | 5.7 | 6.8 |
| Overall | 3.8 ± 0.8 | 3.9± 0.6 |

The entire average weekly feed conversion ratio, under different housing systems do not differ significantly (p≤0.05)

Table-2 *Means cholesterol (mg/dl) of rabbits at 12th week age*

| Treatment | N | Mean (mg/dl) |
|---|---|---|
| Cage housing system | 6 | 32.90 ± 8.136 NS |
| Deep litter housing system | 6 | 19.62 ± 1.895 NS |

Overall mean cholesterol, under different housing systems did not differ significantly (p≤0.05)

The findings are in agreement with the earlier reports [3] and [4], who observed non-significant difference of serum cholesterol due to different housing systems. However, in contrast to the present findings [11] and [14] reported significant (P<0.05) influence of cage housing on serum cholesterol. Lower in serum cholesterol of growing rabbits in the deep housing system may be due to higher movements of animals as compare to cage litter housing. Cage housing group have almost double cholesterol than deep litter group but difference was found non-significant this might be due to small number of animals selected for blood sampling.

Table-3 *Means glucose (mg/dl) of rabbits at 12th week age*

| Treatments | N | Mean (mg/dl) |
|---|---|---|
| Cage housing system | 6 | 138.0 ± 7.920 |
| Deep litter housing system | 6 | 150.8 ± 8.879 |

Overall mean glucose, under different housing systems did not differ significantly (p≤0.05)

Table-4 *Means and standard errors of 12th week triglyceride estimation (mg/dl)*

| Treatments | N | Mean (mg/dl) |
|---|---|---|
| Cage housing system | 6 | 93.87 ± 16.41 |
| Deep litter housing system | 6 | 73.35 ± 13.14 |

### Haemato-Biochemical parameters

### Cholesterol

Cholesterol is waxy substance. It is biosynthesized by all animal cells, because it is an essential structural component of all cell membrane and is essential to maintain both membranes structural integrity and fluidity. Excess cholesterol is linked to many lipid-associated disorders such as atherosclerosis and other cardio-vascular diseases. Lower cholesterol level is preferable. The means and S.E. of serum cholesterol (mg/dl) are presented in [Table-2]. The mean serum cholesterol level was lower in deep litter housing system (52.4 ± 11.1) then cage housing system (96.8 ±11.4 mg/dl) group. The serum cholesterol estimation showed that there was no significant difference found among different treatments. The findings are in agreement with the earlier reports [4] and [3], who observed non-significant difference of serum cholesterol due to different housing systems. However, in contrast to the present findings [11] and [13] reported significant (P<0.05) influence of cage housing on serum cholesterol. Lower in serum cholesterol of growing rabbits in the deep housing system may be due to higher movements of animals as compare to cage litter housing. Cage housing group have almost double cholesterol than deep litter group but difference was found non-significant this might be due to small number of animal selected for blood sampling.

### Glucose

Glucose is a carbohydrate, as an important nutrient. Abnormal glucose metabolism is causally related to a greater risk of several chronic disorders including diabetes and obesity. Blood glucose is a measurable parameter that can be used to assess the severity of a rabbit's condition. Higher blood glucose level is not preferable. The means and S.E. of serum glucose estimation (mg/dl) are presented in [Table-3]. The test of significance for Glucose estimation showed no significant difference due to treatments. Overall, result indicated the lower serum glucose level in cage housing system (138.0 ± 7.920 mg/dl) followed by deep litter housing system (150.8 ± 8.879 mg/dl) group. Difference due to treatments was not significant. The findings are in agreement with the reports furnished by [5] and [3], who reported that serum glucose level was slightly higher but statistically non-significant in deep litter housing. It is further supported by the findings of [1] who have noted that glucose did not differ in cage housing versus deep litter housing. However, the present results are in contrast with the findings of [11] who reported significant influence (P< 0.05) in ventilated house (cage) on serum glucose as compared to housing without ventilation.

### Triglyceride

Triglyceride is an ester derived from glycerol and three fatty acids. It is also present in the blood to enable the bidirectional transference of adipose fat and blood glucose from the liver. Triglycerides are the main constituents of body fat in humans and animals. High triglyceride levels also associated with obesity hence high triglyceride level is not preferred. The means and S.E. of triglyceride estimation (mg/dl) are presented in [Table-4].

The mean serum triglyceride level was lower in deep litter housing system (73.35 ± 13.14) followed by cage housing system (93.87 ±16.41 mg/dl) group. There was no significant difference in triglyceride level between the treatment groups. The findings are in agreement with the earlier reports of [5]. However, the results are in contrast with the earlier findings of [16]. They reported significant difference for serum triglyceride due to different housings. The mean triglyceride level was higher in cage housing system due to the restricted movement of animal as compare to deep litter housing system. The improvements in the various blood components in cage housing treatment may be due to improvement in the immune response and health condition; however, to get concrete conclusion further experiments are needed.

**Conclusion**

From the above findings of research work, by considering overall performance of experimental rabbits, the following conclusions were drawn: The overall feed conversion was numerically higher in deep litter. The cholesterol and triglyceride levels were higher in cage system compared to deep litter housing system; while glucose level was higher in the deep litter housing system may be due to more exercise and free movement as compared to cage housing. No any coccidial oocysts were found in the any of the group. Overall, it was concluded that cage housing system was acceptable in term of management and better growth performance.

**Application of research:** Study of rabbit farming in India and for any other countries. It can be used as guideline for new innovations in managements of rabbits

**Research Category:** Veterinary Science

**Abbreviations:** $T_1$: test group one, $T_2$: Test group two, FCR: Feed Conversion Ratio, SE: Standard Error, mg: Milligram, dl: Desi litre

**Acknowledgement / Funding:** Authors are thankful to Department of Livestock Production and Management, College of Veterinary Science and Animal Husbandry, S. D. Agricultural University, Sardarkrushinagar, 385506, Gujarat, India.

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Research project name or number: MVSc Thesis

**Author Contributions:** All authors equally contributed

**Author statement:** All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

**Study area/Sample Collection:** Rabbit Unit, Instructional Livestock Farm Complex, Sardarkrushinagar

**Animal name:** Rabbit (*Oryctolagus cuniculus*)

**Conflict of Interest:** None declared

**Ethical approval:** Ethical approval taken from College of Veterinary Science and Animal Husbandry, S. D. Agricultural University, Sardarkrushinagar, 385506, Gujarat, India.

Ethical Committee Approval Number: Nil

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