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Effect of different bedding materials on the reproductive performance of broiler rabbits

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Abstract

The effect of different bedding materials on the performance was studied in eighteen adult female broiler rabbits in three kindlings at Small Animal House, Veterinary College Bangalore. Based on bedding material, rabbits were divided into coconut coir group (T1), ragi straw (T2) and wire mesh group without any bedding material (T3). Litter size and litter weight at birth were6.22±0.37 and 246.30±10.74 in T1 group, 5.66±0.37 and 223.70±11.49 in T2 group and 5.77±0.27 and 224.80±8.242 in T3 group respectively. The average litter size and weight at weaning were 5.72±0.28 and 1488±38.73 in T1 group, 4.94±0.26 and 1202±35.45 in T2 group and 4.50±0.27 and 991±39 in T3 group respectively. The highest litter size and weight at weaning were recorded in T1 group which was significantly different ($P<0.05$) from other two groups. The results indicate that coir can be suitably used as a low-cost bedding material alternative to ragi straw.

Key words: Rabbit, litter size, litter weight, coconut coir, ragi straw, wire mesh

Introduction

The search for alternative sources of protein to meet up the population challenge is imperative. In order to maximize food production and to meet protein requirements in developing countries like India, farming of small livestock like rabbits will help in obtaining high quality protein with minimum inputs (Viet Meyer, 1985). A female rabbit can produce up to 80 kg of meat per year i.e. 2900 to 3000 % of her live weight in to meat through progenies because of its positive attributes like shorter gestation period (29-31 days), ability to breed within 24 hours of kindling, produce 4-6 kindlings in a year with 4-8 litters per kindling and its rapid growth rate (2-2.5 kg in 12-15 weeks).

In practice, there are two conventional housing methods in rabbit breeding viz. individual housing in cages without or with bedding or group housing with bedding material. Though wire cage housing is more wide spread because of easy cleaning and better hygiene (Morton *et al*., 1993), increased incidence of foot pad injuries have a clear negative effect on rabbit welfare and on economic costs. It has been suggested that the floor type is the key factor for occurrence of foot pad injuries in rabbits (Drescher and Schlender-Bobbis, 1996). When kept on straw bedding, rabbits have a warmer lying area; there is a lower influence of outside temperature. Bedding material is required for the rabbits to prevent mastitis and sore hock (Rajeshwari *et al*., 2008). It is also needed during their pregnancy to build a nest which is very crucial in the successful rearing of the young ones (Weber and Olsson, 2008). The main aim of nest construction is to protect the kits from cold during their first few days, as they are very sensitive to cold and need temperatures between 30 and 35 0C. In addition, rabbits in the second postnatal week the kits start nibbling at the nest materials (Hudson *et al*., 2000). In commercial rabbit farms, the material used usually depends on the local availability in the country, the most common

being hay, straw, wood shavings, wool, cotton waste, saw dust and others. Though there is enough literature available indicating the effect of wire mesh floor cage and different bedding materials on the incidence of foot pad injuries and welfare and behaviour of rabbits, no literature could be retrieved wherein the effect of different bedding materials like coconut coir and ragi straw on the kindling performance and growth performance of kits.

In southern part of Karnataka, ragi straw is commonly used as bedding material which is a fodder source for ruminants and has seasonal availability. Hence, study was envisaged to find out the alternatives which are available throughout the year as an economical source of bedding material. Hence the present study was undertaken..

Materials and methods

An investigation was carried out to evaluate the effect of different bedding materials on the growth and reproductive performance of broiler rabbits. Before start of the experiment, physical properties like moisture content, absorption capacity and dust content of bedding materials used in the study were analysed. The study also involved assessment of stress levels in broiler rabbits and their preference for different bedding materials.

Selection of the Experimental Animals

The study was conducted in New Zealand White broiler rabbits. Total duration of the experiment was around eight months. Eighteen adult female rabbits (does) with body weight ranging from 2246 to 2458 g were randomly allotted to three different treatment groups of six animals in each group, namely coconut coir bedding (T1), ragi straw bedding (T2) and wire mesh without bedding material (T3) in a completely randomized design (CRD). For breeding, six adult New Zealand White males of body weight ranging from 2387 to 2645 g were selected. Individual rabbits were identified by ear tagging by aluminum tags. The animals were obtained and housed in Small Animal House, Department of Livestock Production and Management, Veterinary College, KVAFSU, Bangalore.

Housing and management of rabbits

Before housing the rabbits, the animal rooms were fumigated with 1:2 concentrations of the potassium permanganate and formalin. The cages were thoroughly washed with hot water and sterilized with blow flame before the start of the experiment. Rabbits were housed in these individual wire mesh cages of 90 x 60 x 60 cms size (L x B x H) for breeding and 75 x 45 x 45 cms size (L x B x H) during kindling and lactation. They were reared under similar managemental and environmental conditions. Animals had free access to clean water and ad lib concentrate feed. The feeders and waters were cleaned daily and bedding was changed once in a week. The bedding materials were procured from local market. The cost of bedding materialswasRs. 10.00/kg for coconut coir and Rs. 15.00/kg for ragi straw on door delivery basis.

Experimental Design

Eighteen pleuriparous does and six bucks of same breed were used in the experiment. The does were divided into three equal sized groups and they were marked as F1 to F6 for (A) first group, F7 to F12 for (B) second group and F13 to F18 for (C) third group. For breeding, six bucks from same parentage were used and they were marked as M1 to M6. All the does were exposed to all three T1, T2 and T3 treatments. In the experiment, with respect to treatment, the bucks were kept constant in all the three kindlings and the female groups were changed in every kindling (as indicated in the breeding plan). Polygamous type of breeding programme was followed, where one buck was bred with three does. The receptive does were identified by observing for moist, pink coloured vaginal mucous membrane. During breeding the does were taken to the buck and allowed to stay with them till the pregnancy was confirmed. The does were examined for pregnancy between two to three weeks after mating, by observation for enlarged abdomen, increased weight and abdominal palpation wherein fetuses were felt as soft grape-sized lumps in a string along the abdomen side. On confirmation of pregnancy, they were shifted to the individual cages. The animals were allowed to breed, kindle and nurse on the respective bedding materials in each kindling as mentioned in the breeding plan. Data from three kindlings of each doe was noted. Thus,data from a total of 54 litters was recorded.

Litter size and litter weight at birth

Litter size was determined by counting the individual live kits born after each kindling. The data of litter size at birth for each treatment was recorded up to the completion of three kindlings. The litter size of kits born was expressed as numbers (nos). After each kindling, weight of the litter was recorded and expressed in grams (g). The litter weight at birth for individual doe in each treatment was maintained till the end of the experiment.

Litter size and litter weight at weaning

Bunnies were weaned at 28 days in all treatment groups. Litter size at weaning was determined by individual counting of bunnies at weaning. The litter size of bunnies at weaning is expressed as numbers (nos). The data of litter size at weaning of each treatment group rabbits was recorded till completion of three kindlings. At weaning, weight of young rabbits was expressed in grams (g). The litter weight at weaning for individual doe in each treatment was maintained till the end of the experiment. Mortality of bunnies was recorded up to weaning.

Mortality percentage was determined as follows:

$$\text{Mortality (\%)} = \frac{\text{Number of kits died}}{\text{Total Numbers of live kits born}} \times 100$$

Results

Litter size at birth (LSB) and litter weight at birth (LWB)

A total of 318 kits were born during the experimental study. The total number of kits at birth in three kindlings were 112, 102 and 104 and average LSB was 6.22+0.37, 5.66±0.37 and 5.77±0.27 in coir bedding (T1), ragi straw (T2) and wire mesh floor (T3) respectively. The LSB in T1 had the highest LSB. However, there was no significant difference (P >0.05) for LSB amongst the treatment groups.

The average LWB (g) in three kindlings was 246.30±10.74, 223.70±11.49 and 224.80±8.242 for coir bedding (T1), ragi straw (T2) and wire mesh floor (T3) respectively. There was no significance difference (P>0.05) for LWB among the treatment groups.The average LSB and LWB (g) from three kindlings is depicted in Table 1.

Litter size at weaning (LSW) and litter weight at weaning (LWW)

A total of 273 kits were weaned during the experimental period. The total number of kits at weaning in the three kindlings was 103, 89 and 81 in coir bedding (T1), ragi straw (T2) and wire mesh floor (T3) respectively. The average LSW was 5.72±0.28, 4.94±0.26 and 4.50±0.27 in coir bedding, ragi straw and wire mesh floor respectively. The highest litter size at weaning was recorded in T1 group which was significantly different (P<0.05) from other two groups.

Average litter weight (g) at weaning in three kindlings was 1488±38.73, 1202±35.45 and 991±39.15 in coir bedding (T1), ragi straw (T2) and wire mesh floor (T3) respectively. There was significant difference (P<0.05) in LWW in between all the groups.The average LSW and LWW (g) from three kindlings is depicted in Table I.

Discussion

The LSB and LWB in all the three groups were almost similar. No significant difference was noticed in LSB or LWB between groups. This may be because the litter size at birth is dependent on genetic factors and is not influenced by managemental changes like change in type of bedding material. However, this may be altered by exogenous hormonal intervention. Litter weight at birth was similar in all the treatment groups because all the three groups of does that were subjected for different treatments were of same breed and of similar weight and were offered same type of feed. Type of bedding did not affect LWB.

Results of this study are in accordance with Blumetto *et al*.,(2010) who reported no significant difference in LSB and LWB for kits reared on straw or wood shavings. Similarly,Eady (2009) also reported no significant difference in LSB for kits in wood shaving or shredded paper. The author opined that this may be due to the fact that the litter size at birth is determined by ovulation rate, fertilization and fetal mortality traits which are not influenced by nest material.

The results of this study are also in agreement with the findings of Miko *et al.,*(2012) who studied the performance between does housed in cages with wire mesh floor and wire mesh floor with plastic foot rest where no significant difference was found in the LSB. But the results of this study are contrary to the findings of Mohammoud *et al.,* (2004) who reported significant difference for LSB in does kindled in wire mesh floor or solid metal floor nest boxes with paddy straw as nest substrate, also Ndor *et al*.,(2010) recorded significantly more number of kits born on mud floor system followed by wood shaving deep litter system and least in cage system.

Ndor *et al.,*(2010) reasoned that the decreased kits born in wire cage floor system may be due to the heat stress associated with cage system which impairs fertility and causes low litter size, while the mud floor system and deep litter with wood shaving bedding system stimulated natural environment that enabled the rabbits to exhibit their potential to the fullest leading to increased litter number at birth. The size of litter at weaning on coir bedding was higher compared to straw and wire mesh floor cage. There was no significant difference in the litter size (P>0.05) between T2 and T3 groups where as significant difference was noted in T1 when compared to T2 and T3 groups. The decreased LSW noted in T3 group was due to the increased mortality seen in kits up to weaning which were reared in wire mesh. In the absence of the nests, some kits died due to the stamping by their dams as they were unable to stay in one place as in nests. This may also be due to the fact that in the absence of nests, the kits were unable to regulate their body temperature as the thermoregulatory mechanism is underdeveloped at early age. The nest helps the kits in keeping them warm so that they do not suffer from hypothermia.

Litter weight at weaning (LWW) was significantly different in all the three groups. LWW was significantly higher in coir group compared to ragi straw and wire mesh group. This may be due to soft bedding material which helps to provide comfortable nursing of does to their kits. The kits in nests were kept warm and also could consume some fecal matter (ceacotrophs) of their does which is rich in nutrients, while the same was not possible for kits without bedding material where fecal material had fallen through the mesh floor.

The results of present study for LSW are contrary with the results of Blumettoet al.,(2010) who reported higher LSW in straw nests compared to pine wood shavings, and they also did not notice any significant difference in LWW which is also contrary to our findings.

But in the present study, LSW was more in coir compared to ragi straw which may be due to the reason that the coir was smooth and soft which provided cushion like comfort to the doe and kits while ragi straw bedding had hard mature stems and sharp and pointed edges and tips which hindered proper nest building and comfort to the does and kits leading to decreased nursing or inadequate thermoregulation which lead to more deaths of kits thus decreased LSW. Present findings are in agreement with the results of Ndoret al.,(2010) who also reported decreased LSW and LWW in wire mesh

floors compared to deep litter with wood shaving as bedding due to the increased mortality of kits in wire cage system. Similarly the LSW results are in agreement with findings of Eady (2009) who recorded significant difference in LSW and LWW in kits reared in two different materials (wood shavings and shredded paper).

Conclusion

The results indicate that coir can be suitably used as a low-cost bedding material alternative to ragi straw in broiler rabbits.

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Table I: Average litter size and weight (g) at birth and weaning on different bedding materials (Mean±SE)

Parameters	T1 (coir)	T2 (ragi straw)	T3 (wire mesh)
Average litter size at birth	6.22 ± 0.37^{a}	5.66 ± 0.37^{a}	5.77 ± 0.27^{a}
Average litter size at weaning	5.7 ± 0.28^{b}	4.94 ± 0.26^{a}	4.50 ± 0.27^{a}
Average litter weight (g) at birth	246.30 ± 10.74^{a}	223.70 ± 11.49^{a}	224.80 ± 8.242^{a}
Average litter weight (g) at weaning	1488 ± 38.73^{b}	1202 ± 35.45^{c}	991.3 ± 39.15^{a}

Note: N=18, Mean values bearing different superscripts differ significantly (P< 0.05)