EFFECT OF DIETARY SUPPLEMENTATION OF YEAST ON FORE, INTERMEDIATE AND HIND PORTIONS OF RABBITS RAISED UNDER CAGE AND PEN SYSTEM OF HOUSING

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ABSTRACT
At 13 weeks of age, rabbits raised under cage system of housing with 2% yeast supplementation in their concentrate (T₂) had significantly higher total weight gain than the pen system and without yeast supplementation (T₁). The rabbits reared under pen system with (T₄) or without yeast supplementation (T₃) had significantly higher portion of fore part hind part and lower portion of intermediate part than the rabbits reared under cage system with (T₂) or without yeast supplementation (T₁).

Key words: Cage, Carcass traits, Pen, Rabbits, Yeast.

INTRODUCTION
Today, 38 recognized breeds and 89 varieties of rabbits (Das et al., 2002) have been reported around the world because of extensive breeding across France, Italy and England (Lebas et al., 1986). Dietary supplementation with yeast (Saccharomyces cerevisiae) significantly increases the growth rate in rabbits (Onifade et al., 1999). Supporting evidences for nutritional feasibility and beneficial effects of probiotics (Das et al., 2002) have also been found.

Other than physiological, biophysical, pathological and biochemical factors that are important to animals, ethological or behavioral factors too affect body weight, some carcass parameters and at times meat quality. However, there are no unanimous standards for evaluation of different housing systems for the carcass traits and behavioral studies are currently used to revise the rabbit housing for space requirements per rabbit and height requirements. To be very precise, there is dearth of scientific information on rabbit housing technologies, because these are not widespread.

Keeping this in mind experiment was carried out to study the influence of alternate housing systems (pen and cage housing systems) and yeast supplementation on some carcass traits.

MATERIALS AND METHODS
Thirty two New Zealand White rabbits of either sex at 6 weeks of age having average body weights of 618.59±10.09 g were selected from Disease Free Small Animal House, LLRUVAS, Hisar. Rabbits were randomly assigned to four treatments in four tier cages (0.45 X 0.45 m, 0.40 m high, 1 rabbit/cage, 4.94 rabbits/ m², n= 16) or in pens with wire mesh floor (1.50 X 2.00 m, 1.00 m high, 4 rabbits/pen, 1.33 rabbits/ m², n= 16) in a closed room where the temperature was maintained 20±5°C and humidity 60+15% during the trial. To provide uniformity in both the housing systems, wire mesh with 1.50 X 1.50 mm square holes and 0.10 mm wire diameter was used. The room had an exhaust fitting for ventilation and glass fitted windows and 2 Compact fluorescent lamps to maintain a light/dark cycle (approx. 12/12). The selected rabbits were shifted to their allotted battery cages and pen, and allowed an adaptation period of 3 days. The experiment consisted of two housing and dietary treatments, each. Experimental rabbits in treatment groups T₁ and T₂ were housed in cage system while rabbits under treatment groups T₃ and T₄ were housed in pen system. T₁ and T₃ were fed standard concentrate diets without yeast supplementation while T₂ and T₄ were fed concentrate diets.

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supplemented with 2% yeast (Saccharomyces cerevisiae and Candida rugosa, 2 × 10^{13} cfu). Rabbits under treatment T₁ and T₃ received concentrates (23.74 % crude protein, 12.02 % crude fibre) while T₂ and T₄ received concentrates (24.53 % crude protein, 11.71 % crude fibre). In addition to concentrate feed, rabbits received locally available Trifolium alexandrinum (15.12 % crude protein, 19.62 % crude fibre) and water ad libitum as per ICAR standards. The feed and water containers were hanged tightly at neck level of rabbits to avoid any spilling and wastage of feed and water. The rabbits were dewormed with ivermectin at the dose rate of 200 microgram/kg subcutaneously and also treated prophylactically against coccidiosis with coccidiostat according to manufacturer’s prescription.

The experimental design and slaughtering techniques were approved by the Institutional Animal Ethics Committee. All the rabbits were weighed at the end of the experimental trial, of which 16 rabbits (4 per treatment) were randomly selected for carcass traits and meat quality analysis. Selected animals were numbered for slaughter, were not subjected to fasting and were transferred in small groups to the slaughter facility at Department of Livestock Products Technology. Slaughtering of rabbits and carcass dissection was done as per the recommendations of Blasco et al. (1992). After the dressing process the reference carcass was then cut between the 7th and 8th thoracic vertebrae and between the 6th and 7th lumbar vertebrae to obtain the fore, intermediate and hind parts, which are weighed separately and the weight of the organs and carcass parts was recorded.

The experimental results were analyzed using IBM SPSS statistics version 21 for windows 7

**RESULTS AND DISCUSSION**

The results of the study revealed that the mean values of fore and hind part % of T₄ and T₃ were significantly higher as compared to T₂ and T₁, respectively. Thus, rabbits raised under modified litter system tend to have higher fore and hind % as compared to rabbits raised under cage system of housing. Though 2% yeast supplementation also have an additive effect on fore and hind parts %, but the results were not found significant when analysed as per duncan analysis. The mean values of intermediate part % in T₁, T₂, T₃ and T₄ were 31.57, 31.82, 27.27 and 27.92, respectively. The reverse was found in mean values of intermediate part.

Thus, rabbits raised under pen system tend to have higher fore and hind % as compared to rabbits raised under cage system of housing. The results of the study also revealed that these mean values of intermediate part percent of T₄ and T₃ were significantly lower as compared to T₂ and T₁, respectively. Also, rabbits raised under pen system tend to have lower intermediate part % as compared to rabbits raised under cage system of housing. Though 2% yeast supplementation has an additive effect on fore, intermediate and hind parts %, but the results were not found significant when analysed as per duncan analysis (Table). The mean values of percent of liver, kidney, heart and lungs were found to be statistically similar in all the treatment groups when analysed as per duncan analysis

Therefore the fore and hind parts of carcass - closely related to locomotor activity - increased at the expense of the intermediate part in the pen housed rabbits. As per Metzger et al. (2003), fore and hind part % was found lower in cage system than pen system, while opposite was the case with intermediate part %. As a consequence of increased

**TABLE 1:** Per cent (%) cut up parts of rabbit meat reared under different treatments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>T₁</th>
<th>T₂</th>
<th>T₃</th>
<th>T₄</th>
<th>Mean ± SE</th>
<th>n=4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fore part</td>
<td>26.31 ± 0.10</td>
<td>27.28 ± 0.08</td>
<td>29.08 ± 0.03</td>
<td>28.97 ± 0.69</td>
<td>28.97 ± 0.69</td>
<td>4</td>
</tr>
<tr>
<td>Intermediate part</td>
<td>31.57 ± 0.08</td>
<td>31.82 ± 0.06</td>
<td>27.27 ± 0.02</td>
<td>27.92 ± 0.25</td>
<td>27.92 ± 0.25</td>
<td>4</td>
</tr>
<tr>
<td>Hind part</td>
<td>33.93 ± 0.22</td>
<td>34.20 ± 0.10</td>
<td>35.67 ± 0.03</td>
<td>35.76 ± 0.34</td>
<td>35.76 ± 0.34</td>
<td>4</td>
</tr>
<tr>
<td>Liver</td>
<td>5.57 ± 0.33</td>
<td>5.22 ± 0.46</td>
<td>5.37 ± 0.03</td>
<td>5.40 ± 0.10</td>
<td>5.40 ± 0.10</td>
<td>4</td>
</tr>
<tr>
<td>Kidney</td>
<td>1.33 ± 0.03</td>
<td>1.28 ± 0.07</td>
<td>1.28 ± 0.03</td>
<td>1.29 ± 0.10</td>
<td>1.29 ± 0.10</td>
<td>4</td>
</tr>
<tr>
<td>Heart and lungs</td>
<td>1.25 ± 0.13</td>
<td>1.29 ± 0.15</td>
<td>1.30 ± 0.09</td>
<td>1.27 ± 0.06</td>
<td>1.27 ± 0.06</td>
<td>4</td>
</tr>
</tbody>
</table>

Values bearing different superscripts in a row differ significantly at p<0.05.
locomotor activity, the ratio of fore and hind part was found higher in pen housed rabbit. On the contrary, the % of intermediate part decreases. This is advantageous since under pen system the weight of most valuable cut up part become higher. Metzger et al.(2003) on comparing the percentage of fore and hind parts to the carcass weight of pen and cage housed rabbits, found that ratio was higher in pen housed while intermediate parts was lower than the caged house. Our results also prove the same that in pen system the fore and hind parts of the carcass, closely related to locomotor activity, increased intensively at the expense of intermediate part. Dal Bosco et al. (2000, 2002) also showed that pen-housed rabbits were superior only in regard of the proportion of the hind part. Van Der Horst et al. (1999) found a increase in the portion of hind and for limb in pen housed rabbits.

In conclusion, it was found that, in pen housed rabbits as a consequence of increased locomotor activity, the portion of fore and hind part was higher while intermediate part was found to be lower than the cage housed rabbits. Thus, rabbits could be reared as per the demand and price of various rabbit parts in the local market, and breeders have to pay attention to the new trends of animal husbandry to increase their profits simply by increasing the portion of most valuable part of rabbit meat by paying attention to the basic management practices of animal husbandry.

REFERENCES
IBM SPSS statistics version 21 for windows 7. Property of IBM corporation, 2012