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# EFFECT OF BREED AND SEX ON THERMO-REGULATORY PARAMETERS OF RABBITS IN NASARAWA STATE NIGERIA

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## ABSTRACT

The study was conducted to determine the effect of breed and sex on thermo-regulatory parameters of rabbits. A total of fifty-four weaner rabbits made up of three breeds comprising of twenty-seven males and twenty-seven females each were procured from National Veterinary Research Institute (NVRI) Vom, Jos, Plateau State, Nigeria and used for the experiment. The rabbits were managed using standard procedure. Six (3 males and females each) of each of the rabbit breeds were assigned using Complete Randomized Design and replicated three times. The thermo-regulatory parameters collected were respiratory rate, heart rate, rectal temperature and ear temperature. Data collected were analyzed using SPSS statistical package version 21. Results obtained indicated that breed had effect ($p<0.05$) on respiratory rate (39.56±0.54- 42.23±0.54) and ear temperature (38.10±0.09-39.38±0.09) and sex had no significant ($p>0.05$) effect in all the thermo-regulatory parameters measured. It can be concluded that any of the sex can be reared in the study area. However, Dutch and Chinchilla breeds adapt more compared to New Zealand White based on the respiratory rate

**Key Words**: Breed, sex, thermo-regulatory, rabbits, Nigeria

## INTRODUCTION

The study of thermo-regulatory parameters in rabbits is essential to understand how different breeds and sexes adapt to varying environmental conditions. In Nigeria, the climatic conditions can significantly impact the physiological responses of rabbits, particularly concerning their ability to maintain thermal homeostasis. The New Zealand White breed has been noted for its lower core body temperature compared to other breeds like Chinchilla, and Dutch. This trait is attributed to its genetic makeup and coat color, which reflects more heat (Jimoh and Ewuola, 2018) and found that during periods of thermal comfort, New Zealand White rabbits demonstrated a superior ability to manage heat stress without a compensatory increase in thermoregulatory activities (Jimoh and Ewuola, 2018).

Mallam *et al*. (2018) observed a significant ($p<0.05$) difference in body weight and linear body measurements among three genotypes of rabbits (Chinchilla, New Zealand White and Dutch). This implies that genotype and sex had influence on growth traits of rabbit and that Chinchilla x Chinchilla showed superiority over other genotypes for five growth traits body weight, head to shoulder, leg length and shoulder to tail followed by New Zealand x Dutch for two traits body length and heart girth (Mallam *et al*., 2018).

Sex also plays a crucial role in thermo-regulatory responses (Jimoh and Ewuola, 2018). Males typically exhibit higher respiratory and heart rates than females, particularly during the evening hours. However, core body temperature remained unaffected by sex differences (Jimoh and Ewuola, 2018). This variation may be linked to hormonal influences, as sex hormones like progesterone and testosterone can alter thermoregulatory set points and responses (Fernandez-Peña *et al*., 2023). For example, progesterone is known to increase body temperature in females during certain phases of the ovarian cycle, suggesting that hormonal fluctuations could affect thermal perception and regulation.

Understanding these differences among breeds in both male and female rabbits are vital for optimizing rabbit husbandry practices in Nigeria particularly in managing heat stress and improving overall welfare. Therefore, the objective of the study was to examine the effects of breed and sex on thermo-regulatory parameters of Rabbits.

## MATERIALS AND METHODS

### The study area

The research was conducted at the Teaching and Research Farm, Department of Animal Science, Faculty of Agriculture Shabu-Lafia Campus, Nasarawa State University, Keffi. The study area located in the guinea savanna zone of North Central Nigeria, and found on latitude $08^0$ 33' N and longitude $08^0$ 32' E (Timveh *et al*., 2022).

### Experimental animals and design

The total of fifty-four (54) weaner rabbits made up of three breeds (Chinchilla, New Zealand White and Dutch) were procured from National Veterinary Research Institute (NVRI) Vom, Jos, Plateau State, Nigeria and used for the experiment. This comprised of 18 (9 males and 9 females) for each breed. The rabbits were housed in well cleaned and disinfected hutches with dimensions of 70 x 60 x 50cm each. The bucks and the does were housed separately and quarantined for two weeks. During this period, the rabbits were dewormed with Endovef® (Ivermectin) at the dose of 0.3 mg/kg subcutaneously and also treated prophylactally against coccidiosis with Amprole 200® according to the manufacturer's prescription. After quarantining, the rabbits were randomly assigned in a completely randomized

design (CRD). The rabbits were fed supplement (roughage) along with concentrate and water both *ad-libitum.* The rabbits were raised under clean and hygienic environment. All the rabbits were medicated appropriately.

**Data Collection**

**Thermo-regulatory parameters**

Thermo-regulatory data of weaner rabbits measured included respiratory rate (RR), heart rate (HR), rectal temperature (RT) and ear temperature (ET). Measurements were taken on weekly basis.

**Respiratory rate (RR)**: - This was measured by visually counting the flank movement for 1 min (breath per minutes).

**Heart rate (HR)**: -This was measured using a stethoscope (beat per minutes).

**Rectal temperature (RT)**: -This was measured using a digital thermometer placed at the rectum of the animal.

**Ear temperature (ET)**: -This was measured by placing the digital thermometer in direct contact with the central area of the auricle.

**Statistical Analysis**

The data on the thermo-regulatory parameters were subjected to Analysis of Variance (ANOVA) using SPSS package (version 21) and significant means was separated using Duncan's Multiple Range Test (Duncan, 1995). All statements of significance were based on the 0.05 level of probability. The general linear model (GLM) of SPSS (version 21) was used to test the fixed effects of breed and sex of the experimental rabbits.

The below linear model was employed

$Y_{ijk} = \mu + B_i + S_j + e_{ijk}$

Y= individual mean observation

$\mu$ = general mean of the population

$B_i$ = Breed effect

$S_j$ = Sex effect

$e_{ijk}$ = random error

**RESULTS AND DISCUSSION**

Table 1 presents the effects of breed on thermo-regulatory parameters of rabbits. The results indicated that breed had significant effects on respiratory rate and ear temperature. New Zealand breed had significantly ($p<0.05$) higher respiratory rate while Chinchilla had significantly ($p<0.05$) higher ear temperature.

Effects of sex on thermo-regulatory parameters of rabbits are presented in Table 2. The results observed in all the thermo-regulatory parameters revealed that sex has no effect on all the parameters taken.

The non-significant effect of breed on respiratory rate and ear temperature in this study is in line with the report of Ondruska *et al.* (2011). The means values for the four thermos-regulatory parameters (rectal temperature, pulse rate, respiratory rate and ear temperature), showed that the values obtained were in line with the standard parameters as observed by Ondruska *et al.* (2011). However, the values in the current study were higher and the reason could be attributed to the weather which is usually cold and to compensate for the heat loss to the environment, animal undergo homeostasis leading to the increased respiratory rate, pulse rate and thus higher rectal temperature observed in this experiment. Fouad (2005) who estimated rabbit rectal temperature (RT) to be 38.6°C to 40.1°C, in agree with the current results. Similarly, Iyegbe-Erakpotobor *et al*. (2012) reported similar values for the effect of seasons on physiological performance of the local rabbits in the Northern Guinea Savanna. Marai *et al*. (1994) reported that RT, PR, and RR as 39.5 °C, 168 and 235 beats per minute, respectively. This is at variance with the results obtained in this study. Several factors had however been found to influence some of these physiological parameters. A report from West Virgina University (2010) observed that respiratory rate was affected by the body size of the animal, environmental temperature, age, exercise and degree of fullness of the digestive tracts and all these varies from one animal to the other.

**Table 1**: **Effects of breed on thermo-regulatory parameters of rabbits**

| Parameters | New Zealand | Dutch | Chinchilla | P-values |
|---|---|---|---|---|
| Respiratory rate (breaths/min) | 42.23±0.54[a] | 39.56±0.54[b] | 40.41±0.54[b] | 0.002 |
| Heart rate (bpm) | 146.51±7.02 | 160.25±7.02 | 146.38±7.02 | 0.277 |
| Rectal temperature($^0$C ) | 39.07±0.07 | 39.02±0.07 | 39.18±0.7 | 0.256 |
| Ear temperature ($^0$C ) | 38.10±0.09[b] | 38.98±0.09[b] | 39.38±0.09[a] | 0.001 |

[ab] Mean with different superscripts differs significantly, significant at 5% probability, bpm= Beats per minute

**Table 2: Effects of sex on thermo-regulatory parameters of rabbits**

| Parameters | Male | Female | P –value |
|---|---|---|---|
| Respiratory rate (breaths/min) | 41.00±0.44 | 40.46±0.44 | 0.393 |
| Heart rate (bpm) | 147.51±5.73 | 154.59±5.73 | 0.383 |
| Rectal temperature ($^0$C ) | 39.06±0.06 | 39.12±0.06 | 0.520 |
| Ear temperature ($^0$C ) | 39.19±0.07 | 39.053±0.7 | 0.188 |

bpm= beats per minute

## CONCLUSION AND RECOMMENDATIONS

Dutch and Chinchilla breeds adapt more compared to New Zealand White based on the respiratory rate. It is recommended that any of the sex can be reared in the study area.

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