

THERMOREGULATORY INDICES OF ADULT RABBIT BUCKS FED DIETS SUPPLEMENTED WITH BREWERS' DRIED GRAIN (BDG) RAISED UNDER TROPICAL CONDITIONS

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ABSTRACT

A study was conducted using twenty (20) growing rabbit bucks to evaluate the effect of feeding brewers dried grain (BDG) on thermoregulatory parameters. The rabbits were randomly allotted into the experimental treatments of four treatment groups with five (5) rabbits per treatment in a completely randomized design (CRD). In the first study, treatments were diets with 0, 20, 30 and 40% level of inclusion of brewers dried grain (BDG), respectively. Feed and water were served *ad libitum*. Thermoregulatory parameters such as respiratory rate (RR), heart rate (HR), rectal temperature (RT), ear temperature (ET) and scrotal temperature were measured weekly. Data generated were subjected to analysis of variance of SAS. There was no significant ($P > 0.05$) difference in pulse rate, respiratory rates, rectal rates and skin temperature across the treatments. On the other hand, ear temperature was significantly ($P < 0.05$) higher in rabbit bucks fed 20, 30 and 40% BDG diets. Rabbits fed 20 and 40% BDG diets had significantly ($P < 0.05$) higher skin temperature. It was concluded that supplementing BDG in the diets of growing rabbit bucks had effect only on ear and skin temperatures by ameliorating heat stress.

Keywords: Rabbit, Bucks, Thermoregulation, BDG, Heat stress

INTRODUCTION

Rabbits, as homeothermic animals can regulate the heat input and output of their bodies using physical, morphological, biochemical, physiological and behavioural processes to maintain a constant body temperature (Marai and Habeeb 1994). The thermo-neutral zone (TNZ) for rabbits is 18–21°C (Habeeb *et al.*, 1998). However, when rabbits are exposed to elevated ambient temperatures imbalances are induced in their body temperature (Habeeb *et al.*, 1999), which adversely affect their growth and reproductive traits (Okab *et al.*, 2008). Furthermore, disturbances in feed intake, feed utilization, water metabolism, blood parameters, enzymatic reactions, hormonal secretions, in addition to protein, energy and mineral imbalances have been reported to be disrupted in heat-stressed rabbits (Okab *et al.*, 2008).

Brewer's dry grain (BDG) is a solid waste from brewery industries. It is available and cheap, but difficult to dry due to its high moisture content for easy storage and use, especially during the wet season. There is a wide variation in the proximate composition of BDG depending on the brewery that produced it (Adejinmi *et al.*, 2013; Achi *et al.*, 2023). The BDG contains about 19-25% crude protein, 10-22% crude fibre, Metabolizable Energy of 7.38 MJ/kg and gross energy of 3030-3170 KCal/kg (Olupona *et al.*, 2002).

Thermoregulation in rabbits is rather poor as they have few functional sweat glands (Jimoh & Ewuola 2016). The ears are also important for cooling as the blood moves to the farthest (coolest) points away from the body core. The rabbit will also stretch its body out as far as possible to cool through radiation/convection. However, due to presence of few functional sweat glands, rabbits lose small amount of moisture through the skin by perspiration (Anoh 2016, Achi *et al.*, 2023). Therefore, the objective of the study was to evaluate the thermoregulatory parameters of growing rabbit bucks fed diets supplemented with BDG.

MATERIALS AND METHODS

Location of Experimental Site

The study was conducted in the Rabbit Unit of the National Animal Production Research Institute (NAPRI), Shika, Zaria. Shika is geographically situated on latitude 11° 12'42''N of the equator and longitude 7°33'14'' E with an altitude of 691 m above sea level (Ovimaps, 2020).

Experimental Animals and Management

Twenty (20) adult rabbit bucks were used for the study. Diet was formulated to meet the nutrients requirement for rabbits. They were fed every morning with the experimental diet (concentrate), containing 18-22% crude protein and 2500-2600 kcal ME/Kg feed. Drinking water was provided daily *ad libitum*. The animals were allowed to adjust to the experimental diet for a period of one week. They were kept in individual metal wire cages measuring 120 × 50 × 60 cm and 75 cm above the ground level. Earthen pots were used as feeders and waterers in each cage.

The rabbits were equally assigned to one of the following levels of BDG 0, 20%, 30% and 40%. They were weighed and randomly allotted to four dietary groups in a completely randomized design. Each group constituted a treatment and each rabbit within a group a replicate. The rabbits were fed 100 g of concentrate daily and given 100 g of hay as supplement three times weekly.

Thermoregulatory parameters; pulse rate, rectal temperature, respiratory rate, ear temperature, skin temperature and scrotal temperature were measured and recorded.

Proximate Analysis of BDG

Samples of BDG were analyzed according to the methods described by (AOAC 1995) at the Biochemical Laboratory, Department of Animal Science, A B U, Zaria

Table 1: Proximate Analysis of the Brewer's Dried Grain

| Nutrient | Percentage (%) |
|---------------|----------------|
| Dry matter | 97.33 |
| Crude protein | 23.38 |
| Crude fibre | 16.56 |
| Ether extract | 18.71 |
| Ash content | 17.08 |

Data Analysis

Data generated were analyzed using the analysis of variance (ANOVA) of (SAS 2002). The significant differences in means were separated using pairwise-difference (P-DIFF, 12).

RESULTS AND DISCUSSION

The effects of feeding diets with varying levels of brewer's dry grain on thermoregulatory parameters of growing rabbit bucks are shown in table 2. There was no significant ($P > 0.05$) difference in pulse rate, respiratory rates, rectal rates and skin temperature across the treatments. On the other hand, ear temperature was significantly ($P < 0.05$) higher in rabbit bucks fed 20, 30 and 40% BDG diets. Rabbits fed 20 and 40% BDG diets had significantly ($P < 0.05$) higher skin temperature. The results for ear and skin temperature followed a similar pattern and were increased with BDG supplementation. The results obtained from the present study were higher than those of (Jimoh and Ewuola 2016) and (Anoh 2016) for rabbit bucks but lower than the report of (Achi *et al.*, 2023). There exist some decreased slightly in Ear and skin temperatures with supplementation of BDG, this could be as result of the ability of rabbits to dissipate heat via the skin during heat stress. Apparent heat stress in rabbits during the hot period due to failure of thermoregulatory mechanism has been observed (Farghly 2011).

Table 3: Effects of Feeding Diets Supplemented with Brewer's Dried Grain on Thermoregulatory Parameters of Growing Rabbit Bucks

| Parameters | Levels of BDG Inclusion (%) | | | | SEM | P-Value |
|--------------------------------------------|-----------------------------|---------------------|--------------------|--------------------|------|---------|
| | 0 | 20 | 30 | 40 | | |
| Pulse Rate (beat/min) | 137.22 | 133.17 | 135.56 | 138.17 | 5.48 | 0.9227 |
| Respiratory Rate (breath/min) | 140.94 | 130.22 | 139.50 | 138.17 | 4.76 | 0.3912 |
| Rectal Temperature ($^{\circ}\text{C}$) | 38.89 | 39.05 | 39.20 | 39.33 | 0.15 | 0.1796 |
| Ear Temperature ($^{\circ}\text{C}$) | 38.89 ^{ab} | 38.09 ^b | 39.09 ^a | 38.60 ^b | 0.19 | 0.0263 |
| Skin Temperature ($^{\circ}\text{C}$) | 38.66 ^b | 39.13 ^{ab} | 38.93 ^b | 39.57 ^a | 0.17 | 0.0020 |
| Scrotal Temperature ($^{\circ}\text{C}$) | 37.66 | 38.23 | 38.16 | 38.40 | 0.21 | 0.0790 |

^{ab}Means with different superscripts within the same row are significantly different, SEM - Standard error of mean

CONCLUSION

It can be concluded that brewers dried grain which is a relatively cheap feed resource material can be included in the diet of rabbits to ameliorate heat stress as in ear and skin temperature.

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