

Tolerance of New Zealand White and Californian doe rabbits at first parity to the sub-tropical environment of Egypt

I.F.M. Marai^{*}, A.A. Askar, L.B. Bahgat

Department of Animal Production, Faculty of Agriculture, Zagazig University, Zagazig, Egypt

Received 16 June 2005; received in revised form 10 April 2006; accepted 18 April 2006

Abstract

Tolerance of New Zealand White (NZW) and Californian (Cal) doe rabbits at the first parity to the sub-tropical environmental conditions of Egypt was evaluated. The study included 1090 parturitions: 601 NZW and 489 Cal. The does used were 5 months of age and 3.1 ± 0.10 kg mean body weight. The study was carried out during the different seasons of the year. The results showed that the effects of breed on the traits studied were not significant except on the doe kindling weight. However, the traits studied were, in general, higher in NZW than in Cal. The estimated temperature–humidity index (THI) average values were 19.8, 18.0, 23.7 and 25.7 during autumn, winter, spring and summer, respectively, indicating absence of heat stress during autumn and winter (less than 22.2) and exposure to severe (more than 23.3) and very severe heat stress (more than 25.6), during spring and summer, respectively. The effects of season of kindling were highly significant ($P < 0.001$ or 0.01) on conception rate, gestation period, kindling weight, litter weight at birth (live and total), 21 days of age and at weaning and kit weight at birth. The values were, in general, the lowest ($P < 0.05$) during the very severe heat stress in summer, while the kindling interval and pre-weaning mortality were the highest in summer. Adaptability was estimated (during the four seasons of the year) to be 93.3% and 95.1% for NZW and Cal, respectively. No interactions were observed in the analysis.

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Keywords: NZW and Cal doe rabbits; Season of birth; Productive; Reproductive traits

1. Introduction

The NZW and Cal rabbits were introduced a few decades ago to the sub-tropical environment of Egypt to diminish the gap between meat production and consumption in the country.

However, in such environment, rabbits are susceptible to heat stress since they have few functional sweat glands and difficulty in eliminating body heat (Marai et al., 1991, 2001, 2002; Finzi et al., 2000). Heat stress is aggravated with the high relative humidity (Marai and Habeeb, 1994; Yamani and Farghally, 1994) which is normally over 85% during the day and can reach 100% during the night during the hot months in Egypt.

^{*} Corresponding author.

E-mail address: profmarai@yahoo.co.uk (I.F.M. Marai).

Recently, debate has arisen regarding the extent to which NZW and Cal rabbits can tolerate such adverse conditions. Marai and Habeeb (1998) indicated that the best adapted breed would show the least deviations from normal in the productive and reproductive traits. In other words, the physiological functions, productive and/or reproductive animal traits can be used in estimation or detection of adaptability.

The present study aimed to investigate the reproductive performance traits of the NZW and Cal adult does at first parity as affected by subtropical environmental conditions of Egypt. Adaptability values for the two breeds have also been estimated.

2. Materials and methods

The work was carried out in the Rabbitry of the Animal Production Department, Faculty of Agriculture, Zagazig University, Zagazig, Egypt. The study included 1090 parturitions (601 NZW and 489 Cal) of doe rabbits 5 months of age and 3.1 ± 0.10 kg mean body weight.

The animals were fed ad libitum a commercial pelleted ration containing 18.1% crude protein, 13.2% crude fibre, 2676.0 kcal/kg digestible energy and 2.4% ether extract. The values were determined according to A.O.A.C. (1980), and calculated according to NRC (1977).

The does were housed in a conventional naturally ventilated windowed building provided with sided electric fans, i.e. ventilation was partly natural and partly forced air.

The animals were raised individually in wire cages ($59 \times 55 \times 29$ cm) provided with feeders and automatic drinkers. Nest boxes ($40 \times 32 \times 29$ cm) were provided for kindling and nursing the kits up to weaning. Cages and nest boxes were cleaned regularly and disinfected before each kindling. Kits were raised after weaning in collective cages similar to those of does, but without nest boxes. Urine and feces on the rabbitry floor were removed every morning. All rabbits were reared under the same environmental conditions. The ambient temperature ($^{\circ}\text{C}$) and relative humidity (%) values within the rabbitry building during the course of the study are shown in Table 1.

Table 1

Averages of ambient temperature ($^{\circ}\text{C}$), relative humidity (%) and temperature–humidity index (THI) in the rabbitry during the experimental period

Seasons	Ambient temperature ($^{\circ}\text{C}$)	Relative humidity (%)	Temperature–humidity index (THI)
Winter	18.4	67.4	18.0
Spring	24.9	64.3	23.7
Summer	30.0	86.1	25.7
Autumn	21.5	73.2	19.8

Does were mated with bucks of the same breed. The buck/doe ratio was 1:5. The doe was placed in the cage of a randomly chosen buck for 5 min. All does were mated twice whenever possible. Forced mating was performed if the doe refused to accept the buck. Ten days after mating, does were palpated to detect pregnancy. Does that failed to conceive were remated with randomly chosen bucks on the day of palpation. Does that failed to conceive after three matings were culled. On the 27th day of pregnancy, the nest boxes were prepared for kindling and supplied with wood sawdust. At kindling, kits were examined and registered within 12 h. Kits were weaned 30 days after kindling. At weaning, kits were registered, separated from their dams and housed in wire cages, with a maximum number of 6 kits per cage. The doe was weighed immediately after kindling.

The traits studied were conception rate (percentage of services leading to pregnancy relative to all services), gestation period, doe weight after kindling, kindling interval, litter size and weight at birth (live, dead and total), 21 days and at weaning, kit body weight and gain and percentages of stillbirths and pre-weaning mortality.

The temperature–humidity index (THI) was estimated according to the formula of Marai et al. (2001) as follows:

$$\text{THI} = \text{db } ^{\circ}\text{C} - [(0.31 - 0.31 \text{ RH})(\text{db } ^{\circ}\text{C} - 14)],$$

where db $^{\circ}\text{C}$ =dry bulb temperature in Celsius and $\text{RH}=\text{RH}\%/100$. The estimated values of THI were classified as follows: <22.2 =absence of heat stress, 22.2 – 23.2 =moderate heat stress, 23.3 – 25.5 =severe heat stress and >25.5 =very severe heat stress.

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