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THE EFFECT OF A HIGH AMBIENT TEMPERATURE ON THE REPRODUCTIVE RESPONSE OF THE COMMERCIAL DOE RABBIT[1]

J. B. Simplicio[2], J. Fernandez Carmona y C. Cervera

Dept Ciencia Animal. Universidad Politécnica de Valencia. Spain.

INTRODUCTION

Environment affects productivity of commercial rabbits. Although these animals should be well adapted to semi-arid areas, in practise, reproductive processes are adversely affected by exposure to heat and therefore the rate of production is low.

Voluntary food consumption is depressed too and the recommended feeding standards often have no practical value, since they cover too narrow a range of temperatures or they don't consider the climatic in many countries.

The effect of high ambient temperatures on the growth of rabbits has occasionally been assessed, but there are no data on gestation-lactation cycles for this specie. This experiment tried to study the long-term effect of a high ambient temperature on the main productive indexes in does fed on two different, high quality diets.

MATERIALS AND METHODS

Animals. One hundred and eight crossbred New Zealand White does were used for eighteen months, after two more for adaptation, to study the effect of two diets offered 'ad libitum' and two temperatures (A ambient, H high).Controls for conception rate, prolificity, litters, weight and intake started at 3.5 Kg liveweight, when does were mated for the first time.

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[2] Actual address: Centro de Tecnologia Rural, Universidade da Paraiba, Brasil.

Remating interval after parturation was 9 days and weaning at 32 days of age. Does were removed because for illness, low fertility or stillbirth and replaced by nulliparous animals.

Diets. The composition of diets is shown in Table 1. Both had the same percentage of luzerne meal, and they were supplemented with furazolidone (150 g/Kg), cycostat (10 g/Kg) and a vitamine-mineral mixture.

Table 1. Composition of diets (%DM).

	Diet	
	1	2
Dry matter	91.7	91.4
Crude protein	19.2	18.0
Crude fiber	12.0	11.9
ADF	18.0	18.0
Ether extract	6.6	2.9
Digestible energy, Kcal.g^{-1}	3.1	2.8

Housing. Two different types of environment were used in the experiment. A traditional building with static ventilation (A) and an insulated climatic room, with a forced ventilated system, artificially heated at a 30ºC constant temperature (H). Animals were allocated in a flat-deck cage design.

Statistical methods. An analisys of variance and covariance with two factors (diet and temperature) was carried out, using the BMDP program of the University of California.

RESULTS AND DISCUSSION

Most parameters were not significantly influenced by type of diet, so the higher energy and protein percentage of diet 1 did not elicit any improved animal performance. Mendez et al,1986 and Cervera et al,1987, have shown that feed intake was related to digestible energy, but they used diets with a larger difference in protein and energy content. For that reason the following Tables only show the overall means for the diets.

Voluntary feed intake was significantly influenced ($p<0.001$) by environment, although showing the characteristic increase in the lactation period. Actual figures being approximately 66% higher in treatment A, when

given either in terms of grams per animal and metabolic weight (Table 2). Apparently we could not consider that animals became heat-acclimatized (Sod-Moriah,1971) as far as food intake was concerned.

Table 2. Feed intake (g DM. Kg^{-1})

	Temperature		Level
Week	Ambient	High	signific.
Gestation, 4th	89	64	p<0.001
Lactation, 1st	68	54	p<0.001
2nd	94	66	p<0.001
3rd	106	77	p<0.001
4th	128	79	p<0.001
5th	127	83	p<0.001

There are no substantial works on high temperature controlled environment, but during summer, Mendez et al,1986 and Fernandez-Carmona,1984 found somewhat higher figures. Prud'hon,1976 in a 30ºC constant ambient published similar results working with non-lactating adult does.

Energy requirements during pregnancy were scarcely satisfied in treatment H, but clearly low for production of milk, which cannot reach normal levels, considering that does of 4000 g average weight ingested only 190 g DM daily.

Nitrogen balance in A and H during this period was 0.98 and 1.90 g $N.d^{-1}$ respectively, and the urinary to ingested nitrogen ratio was substantially higher in A, so it would confirm that protein catabolism is impaired in a heat stress condition.

Average weight of does H was 3850 g, suggesting that their corporal reserves were not easily accumulated. Liveweight gain in gestation oscillated normally for A does, but was poor for those in H environment, even lower than litter weight at birth. Does usually reconstitute body reserves throughout the reproduction cycle, but H animals did not have that opportunity, and hence they refused to be mated, showed a low conception rate and mortality of foetuses increased.

Reproductive traits were more satisfactory in A ambient: Percentage of does accepting to be mated was 27 higher and parity interval shorter; some of H does delivered spontaneously. Mortality of pups at birth, followed the

same trend mentioned by Rich and Alliston, 1970, but after birth was higher for A treatment, probably according to the risk of cold exposition and size of litters.

Table 3. Variation of liveweight (g/doe)

	Temperature		Level of
	Ambient	High	signific.
Average weight	4170	3850	p<0.001
Gestation	481	251	p<0.001
Lactation,21 days	323	194	p<0.001
Lactation	312	63	p<0.001

Litter weight at birth and 21 days of age were significantly higher in A conditions, although the difference was only significant for litters with 5 or more pups alive. Similarly weight of litters at weaning with more than 4 rabbits was significantly higher.

Table 4. Reproductive performance

	Temperature		Signif. of
	Ambient	High	diferences
Parity interval, d	48.8	54.0	NS
Litters per doe, No	2.5	2.2	NS
No. born total/litter	9.2	7.6	***
No. born alive/litter	8.0	7.1	*
No. weaned/litter	5.9	5.2	*
Litter wt. at birth, g	392	313	**
Litter wt. at 21 days, g	2076	1635	**
Litter wt. at weaning, g	4020	3135	**

NS non significant, * p<0.05, ** p<0.01, *** p<0.001

Based on the results of this study, it seems that a high ambient temperature, through a drastic depresssion in food ingestion, impedes mature liveweight from being reached and results in a very slow rate of growth of pups, with the exception of small litters. Does are in a poor bodily condition which impairs their reproductive performance.

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Dept. Ciencia Animal. Universidad Politécnica de Valencia. Spain.

SUMMARY

One hundred and eight New Zealand does were given two experimental diets formulated for two digestible energy content (2.7 and 2.5 Kcal.g^{-1} as fed-basis) and an energy:protein ratio of 18 Kcal DE/g DP. Does were housed in a traditional free ventilated building or in a climatic room at a constant temperature of 30ºC (treatments A and H).

The comparison between both diets did not show any significant difference, but almost all the indexes studied in the present experiment were significantly affected by high ambient temperature. Parity intervals were 49 and 54 days, pups per litter 8.0 and 7.1, and litter birth weight 392 and 313 g. on treatments A and H respectively. Pup growth was impaired in treatment H, as rabbits reached 1635 g. at 21 days of age and 3135 g. at weaning, compared to 2076 and 4020 g. in treatment A.

Feed intake was considerably lower throughout lactation in treatment H, and related to the low performance observed in does housed at 30ºC.

RESUMEN

Se utilizaron 108 conejas New Zealand alojadas en dos ambientes distintos, en una cámara climática a 30ºC de temperatura (H) y en una granja tradicional (A). También se probaron dos piensos con contenidos energéticos distintos (2.7 y 2.5 Kcal ED/g sobre materia fresca) y similar razón energía:proteína.

Los piensos no afectaron a los índices estudiados, pero la temperatura alta los empeoró significativamente. Así, el intérvalo entre partos fue de 49 y 54 dias, el tamaño de camada 8.0 y 7.1 y el peso de la camada al nacimiento 392 y 313 g para los tratamientos A y H respectivamente. Los gazapos en tratamiento H alcanzaron 1635 g. a los 21 dias y 3135 g. al destete, mientras que las cifras en el tratamiento A fueron 2076 y 4020 g.

La ingestión de pienso fue considerablemente inferior durante la lactación en el tratamiento H y causa directa de la respuesta observada en las conejas alojadas a 30ºC.

[1]Actual address; Centro de Tecnologia Rural, Universidade Federal da Paraiba, Brasil.