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## **INFLUENCE OF DENSITY ON PRODUCTION AND "OPEN-FIELD" BEHAVIOUR OF RABBITS REARED ON GROUND FLOOR**

**ABSTRACT** - 168 thirty-day old hybrid rabbits (83 males and 85 females) were stabled on ground floor at two different densities (Group 1:850 cm<sup>2</sup>/head, N=69; Group 2:600 cm<sup>2</sup>/head, N=99), until slaughter, when they were ninety days old. The assessed variables were both production (weight gain, feed conversion index, slaughter yield and mortality rate ) and behaviour (reactivity in the "open field" test repeated three times: 1) one week after the beginning of the experiment; 2) half way through the fattening period; 3) at the end of the experiment.). Results show that rabbits reared at lower density have higher production compared to the others; moreover their "open field" reactivity seems to indicate higher adaptive capacity.

**INTRODUCTION** -The study of alternative systems to the cage in rabbit breeding can provide interesting data in order both to contain production costs and to take into greater consideration the animal welfare, keeping nonetheless the production still economically rewarding for the breeder. From the point of view of rabbit's welfare, the traditional cage breeding can produce stress in animals (Drescher, 1992; Metz, 1987), which can reflect on adaptive behaviour, possibly also influencing as well physiological, immunological and productive aspects (Wiepkema & Koolhaas, 1993; Broom & Johnson, 1993; Stauffacher, 1992; Podberscek et al., 1991; Mori & Bagliacca, 1985). Breeding on ground floor may probably better meet the specific characteristics of rabbits, allowing them also to react in a more adaptive way to potentially stressing stimuli, such as a new environment, as "open field" test studies pointed out ( Ferrante et al., 1992 ).

This research was focused on alternative stabling systems, on the problems concerning breeding on litter for the entire fattening period, assessing: a) production of the animals comparing two different densities; b) individual reactivity of a sample of animals to the "open field" test to assess their capacity of adapting to a completely new environment.

### **MATERIALS AND METHODS**

168 hybrid rabbits (83 males and 85 females) were studied from the age of 30 days to slaughter, at the age of 90 days. The animals were randomly divided into two groups having different densities and stabled into two pens, with natural climate and photoperiod: Group 1: 69 animals with 850 cm<sup>2</sup>/head, and Group 2: 99 animals with 600 cm<sup>2</sup>/head. In each pen there were two drinking-troughs and two feeding-troughs where the animals were given concentrated pelleted feed. Before the experiment 20 kg of oat straw had been scattered on the floor. Used straw was replaced in the same quantity. The animals were individually marked and weighed every week for the entire length of the experiment. An analysis of Variance by GLM ( Searle, 1971) related to density and sex of the animals was performed on weights and weight gains. Feed conversion index and mortality rate in the two groups were assessed as well.

A sample of animals (10 males and 9 females of Group 1; 10 males and 10 females of Group 2) was submitted to the "open field" test (Ferrante et al, 1992; Mejsser et al., 1989; Kilgour, 1975), in a 144cmx144cm apparatus, with 80 cm high full walls and a black rubber flooring.

divided in numbered squares. The test, lasting 5 min, was repeated three times: 1) one week after the beginning of the experiment; 2) half way through the fattening cycle; 3) at the end of the experiment. The video-recorded behaviours, evaluated in seconds, included: latency to the first movement; movement; freezing; escape attempts; standing still; alert; grooming; exploration. Data have been statistically analysed with Multivariate Analysis (Principal Component Analysis, Lewis, 1992) and Univariate Non parametric Analysis of Variance (Siegel, 1956).

## RESULTS AND DISCUSSION

**Production variables** - Since the fifth week of the experiment rabbits of Group 1 had significantly higher final weights compared to the others ( $P < 0.001$ ; Figure 1 and 2), in agreement with the results from other authors (Gallazzi, 1985), and can refer to a possible overcrowding stress of rabbits in Group 2. This stress, according to Weber & Van der Walt (1977) can also lead, in the rabbit, to pathologic heart alterations. As far as sex is concerned, females in Group 1 reached higher liveweights and carcass weights than males. The opposite occurs in Group 2, in which males reached higher weights in the last four weeks of the experiment. This can be explained with a greater competitiveness for feed, where more territorial males (Vastrade, 1986) managed to prevail. The feed conversion index was similar in the two groups (Group 1:3.85; Group 2:3.86), and similar to those found by other authors (Crimella et al. 1987). The slaughtering yield has been rather high (62%) and similar either for Groups or for Sexes. The mortality rate also was rather acceptable in Group 2 (4.04%). In Group 1 it was higher (8.69) due to a Pasteurellosis infection that nonetheless has produced only a slight decrease of the final live weight.

**Behaviour variables** - As far as the differences between the two Groups are concerned, in Group 1 a gradual increase of freezing in the three repetitions and a parallel decrease of the exploration and escape activity were observed, while in Group 2 these modifications appeared since the second repetition (Figure 3 and 4). This can show a higher tendency of Group 1 rabbits to contrast the stressor, while Group 2 rabbits showed a quicker and more passive stress answer (Henry & Stephens, 1977). No correlations were found between the weight of the animals and their behaviour. The only difference noted between males and females is that Group 2 females showed higher standing still and successively freezing times than males, probably due to a greater sensitivity to stress related to overcrowding. Moreover, Principal Component Analysis has shown three main factors (Figure 5): 1) freezing and standing still; 2) movement, escape attempts, alert, exploration and grooming; 3) latency to the first movement. This may show the contrast between: a) active searching of a way out of the stressing situation and b) defensive mimicry posture, among which an ambivalent attitude interposes. These reactions were interpreted in the same way by other authors (Kilgour, 1975; Walsh & Cummins, 1976; Ferrante et al., 1992).

## CONCLUSIONS

Production has proved to be comparable to the one obtained with cage breeding at similar density, and has been negatively influenced by a higher animal density. The results of the "open field" test as well showed a better reactivity in animals reared at lower density. They appear to have a higher exploring tendency and lower freezing, at the beginning, as well as an active attempt to contrast stress, while the other animals are immediately overwhelmed by it.

In conclusion, breeding rabbits on ground floor at not too high density can be considered a valid alternative system. Further research is needed to assess the effects of such a breeding on the health aspects of the animals.

## AVERAGE WEIGHT OF RABBITS

### GROUP 1

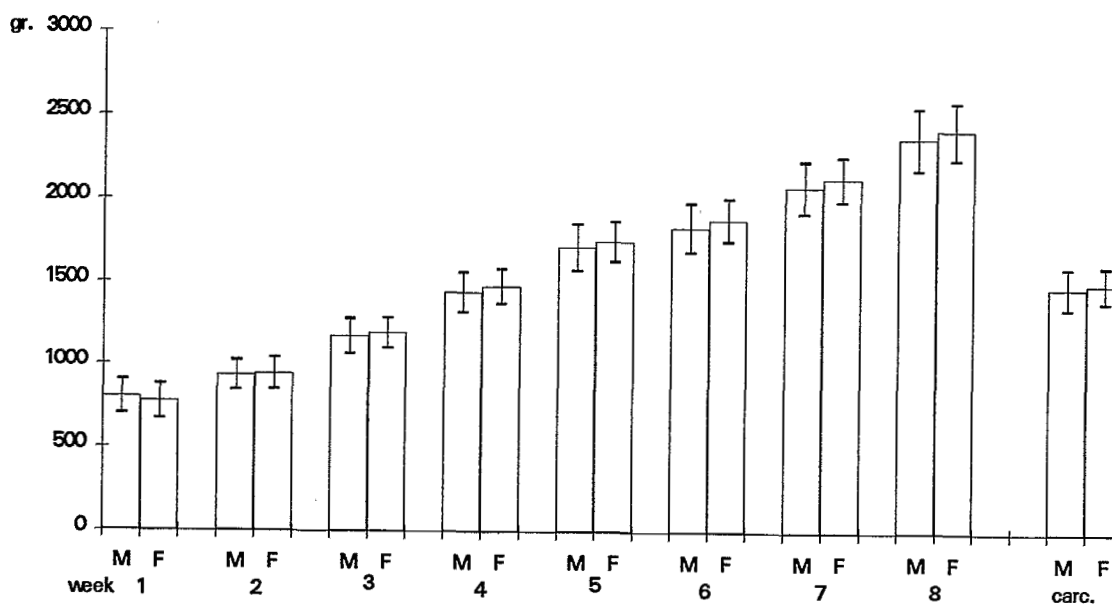


Figure 1\*

### GROUP 2

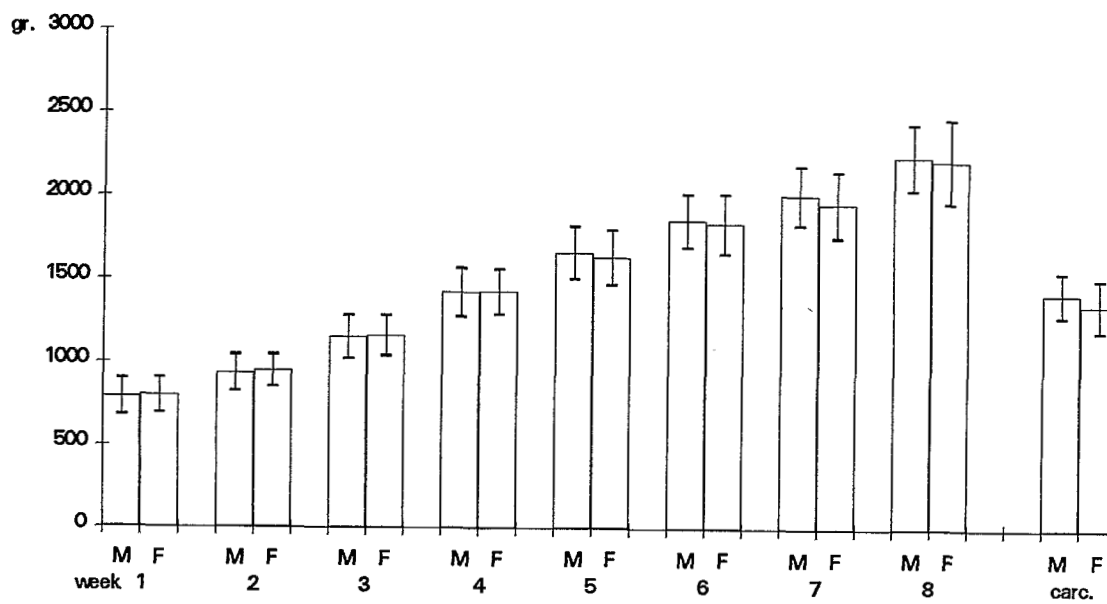


Figure 2\*

\* M= males

F= females

**BEHAVIOUR IN "OPEN-FIELD" TEST  
(AVERAGE VALUES)**

**GROUP 1**

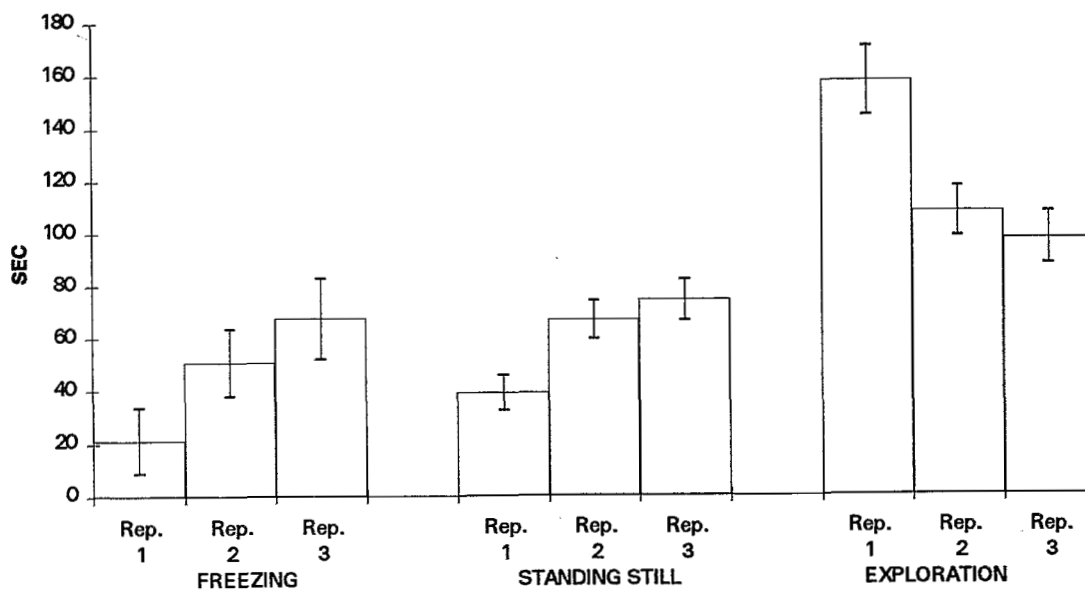


Figure 3

**GROUP 2**

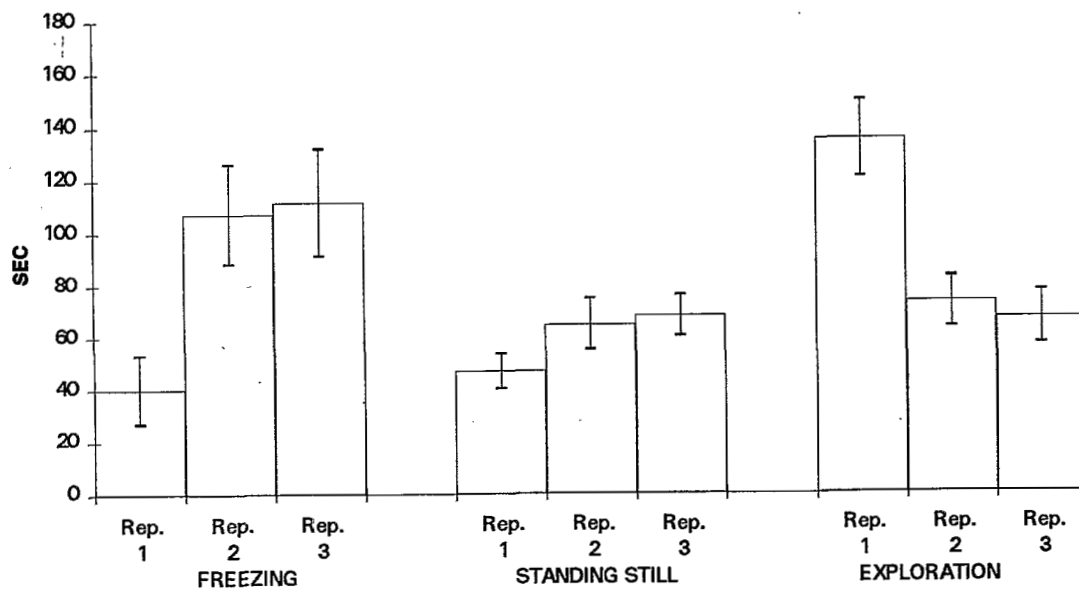
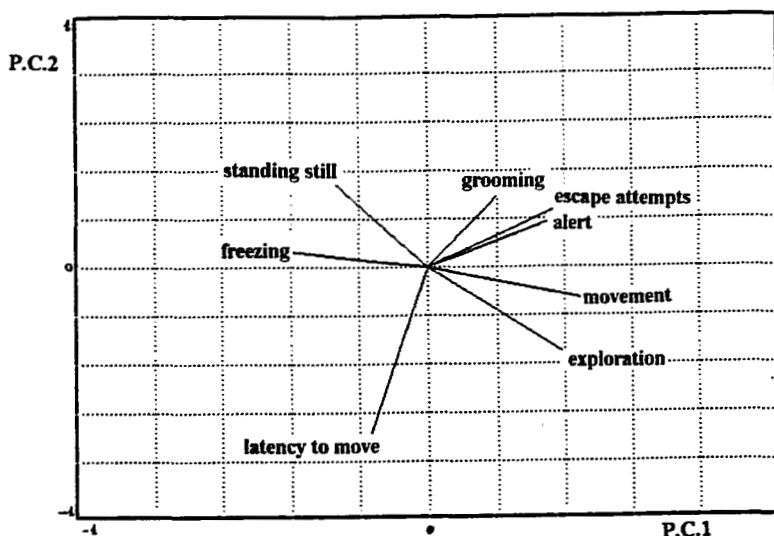


Figure 4

**Figure 5 - PRINCIPAL COMPONENT ANALYSIS OF OPEN-FIELD BEHAVIOUR**

(autoscaled data)

VARIABLES: latency to move; movement; freezing; escape attempts; alert; grooming; standing still; exploration.



	VARIANCE %	CUMULATIVE VARIANCE %
P.C.1	44.41	44.41
P.C.2	15.84	60.24
P.C.3	12.49	72.73

LOADINGS OF THE ORIGINAL VARIABLES								
	latenc.	movem.	freez.	esc.att.	alert	groom.	st.still	explor.
P.C.1	-0.171	0.470	-0.399	0.387	0.366	0.212	-0.283	0.427
P.C.2	-0.705	-0.134	0.070	0.252	0.196	0.316	0.371	-0.376
P.C.3	-0.040	0.049	-0.613	-0.249	-0.138	-0.166	0.676	0.232

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