Proceedings 4th World Rabbit Congress, 10-14 October 1988, Budapest Hungary, Vol. 1, 215-225

ALTERNATIVE HOUSING SYSTEMS IN MEAT RABBIT BREEDING

Crimella C., Luzi F. and Amboini M.*

* Istituto di Zootecnica Vet. - Università di Milano

INTRODUCTION

One of the ways to keep production costs of intensive rabbit breeding low is to consider an alternative housing to the traditional housing, which should allow, at equal performance levels, for low investment costs. In commercial breeding, the parameters used to assess production efficiency are chiefly Daily Weight Gain (D.W.G.), Feed Conversion Rate (F.C.R.) and Slaughter Performance (S.P.); statistical data characterizing the weaning-slaughter period (day 30 to 80 approx.) This particular moment in the productive life of the commercial rabbit was analysed in order to determine whether higher profits, which amounts to higher productivity, can be achieved also with different housing systems (1-2). The use of straw litter as a possible alternative to cages has been already investigated into not only by our Institute, and the literarure on the subject is providing insufficient information for a direct confrontation between these different housing systems (3-4-5-7-8-9-10). At the same time, given the world-wide interest in determining the exact "welfare space" of animals reared under intensive husbandry conditions, the parameter surface/animal was considered a source of variability as the literature reports many contrasting indications (6-11-12-13-14).

MATERIALS AND METHODS

This research involved three fattening trials, each divided into two

periods: the 1st from the housing day (day 32) to day 59; the 2nd from day 59 to slaughter usually occurring on day 80. These trials, which lasted approx. 12 months involved rabbits housed under different conditions (cage vs. litter) trying to faithfully reproduce the environmental and managerial conditions of a standard rabbit farm. Each trial involved 574 rabbits (commercial hybrids in the 1st trial, half New Zealand White and half commercial hybrids in the 2nd, and N.Z.W. in the 3rd) at about day 32, half males and half females, randomly divided in the following eight groups: M1-M2-A-B-C-D-E-F.

Groups M1 and M2, constituted of 59 rabbits each, were housed in the cage of our Institute's stabularium. This structure is climatized with a forced ventilation system connected to temperature probes. Light was provided 16h a day, from 6 A.M.: the slurry was removed every day by a conveyor belt system.

Each group of rabbits was housed in modules of four 2-floor cages, each module measuring 155x203 cm. Cage sizes were as follows:

Cages A - 203x40x25 cm divided in 8 boxes of 40x25x25 cm;

Cages B - 203x53x35 cm divided in 5 boxes of 40x53x35 cm;

Cages C - 203x60x25 cm divided in 5 boxes of 60x40x25 cm.

All the cages were made of galvanized, electric welded wire mesh: the troughs in cages A and C were linear and fitted with an anti-wasting device; the troughs in cages B were hopper-troughs.

The rabbits were housed according to the following scheme:

Cage	Nr of Rabbits	Rabbits/cage	Area/rabbit (cm2)	Nr of Rabbits per m2
A	8	1	1000	10
A	16	2	500	20
B	15	3	700	14
C	20	4	600	17

The remaining 456 rabbits were divided into 6 groups (A-B-C-D-E-F) each constituted of 76 subjects and housed "on the ground" on deep oat straw litter in a tunnel-shaped barn located 50 Km far from our Institute. This structure, properly insulated, was fitted with adjustable dome windows which provided natural illumination and aeration. Each group of animals was placed in 6.6 m2 enclosures fenced with wire mesh (h=60cm) on oat straw (20Kg per enclosure); the litter was removed at the end of the cycle. Each enclosure was provided with a constant level channel drinker 200cm long and two circular hopper-troughs each containing 16Kg of feeds, which is the equipment currently used in poultry-breeding. After the first 4-week period, at day 59, the rabbits were caged. Groups A-B-E-F were transferred to Milan and placed in the stabularium according to the same criterion used for groups M1 and M2: groups C and D were housed in original barn in two cage modules identical with those in the stabularium. The 2nd phase of fattening lasted three weeks and ended with the slaughter of 81-day old rabbits. Commercial feeds (Table 1) were fed ad libitum in each trial. The animals, after marking were individually weighed every week on fixed days and at fixed hours as were the feeds left over in the troughs. The rabbits were scales provided with oscillation damping and 5gm allowance. During the 1st 4 weeks of fattening all the rabbits received coccidiostatic prophylaxis consisting in two types of coccidiostat added to the feeds. In the 2nd and 3rd trials the rabbits received therapeutical treatments: in the 2nd for a mycosis and in the 3rd for scoures. These pathological conditions occurred almost under the same form in all the groups. The average weekly weight gains were analysed by Analysis of Variance and Co-variance in fuction of the parameters considered every time according to the following equation:

$$\gamma_{ijklm} = \mu + \alpha_i + \beta_j + \gamma_k + \delta_l + \eta_m + b_{1\times1} + \varepsilon_{ijklm}$$

where:

y = dependent variable

μ = mean

$\alpha_{1,4}$ = treatment (meaning 4 different housing systems)

$\beta_{1,8}$ = group (meaning 8 different housing locations)

$\gamma_{1,5}$ = density (meaning 5 different surface situations per housed rabbit)

$\delta_{1,2}$ = coccidiostat (meaning the two types of coccidiostats used)

$\eta_{1,2}$ = sex (division by sex)

b_{1x1} = co-variance (1st weight)

In the 2nd trial factor $\vartheta_{1,2}$ is the genetic strain.

RESULTS AND CONCLUSIONS

The final evaluation chifly took into account the evolution of only two trials, the 3rd trial having been influenced by a pathologic condition which had partly conditioned its results. In the 1st period (up to day 59 before the transfer of the rabbits in cages), no difference in the D.W.G. so significant as to determine the preference for one of them, was registered (Table 2). The 2nd period registered difficulties of adaptation to the new housing conditions in the rabbits previously placed on litter, with the subsequent alteration of D.W.G. and of the growth curves in the favour of the rabbits constantly housed in cages (Table 3, Diagrams 1-2-3-4). Furthermore, greater difficulties of adaptation were shown by the rabbit transported to Milan and shifted from litter to cage, which shows how shipping stress and change of habitat can affect production performances. The F.C.R. trend in the 1st period remained as significantly lower values in rabbits reared on litter. It should be added that they ate the litter straw (Table 5). Successively, with the occurrence of the stress of adaptation to the new housing environment, the F.C.R. trend improved in the rabbits always kept in cages; with the compensation of the two events the overall trend of the periods does not show significant differences

(Tables 6-7). The Analysis of Variance in fuction of density intended as the surface available per animal, evidenced during the 1st period significantly different results such to render the optimum space/animal value difficult to determine. It should be considered that during the 2nd period of fattening the differences diminished to insignificant values in the 1st trial. Finally, no influence was recorded in relation to sex nor in function of the coccidiostat used, even though the results obtained in the 3rd trial are in contrast with this latter variable (see previous reservations on the evolution of the 3rd trial) (Table 8). The Slaughter Performance (S.P.) proved to be only slightly higher in the rabbits always kept in cages; but also in this case with statistically insignificant differences (Table 9). As regards a possible evaluation of the genetic type (New Zealand White and commercial hybrids) of the rabbits reared, it can be said that the so called hybrid population seem to be the best even though from time to time contingent situations inherent to the three trials do not allow to evidence their superiority in each situation for any parameter considered (Table 10).

This research showed that the productive performance of the rabbits is substantially similar in the two housing systems. The obvious aspect in favour of litter housing is the inexpensive equipment necessary, which may reduce the incidence of fixed costs on meat production. However, previous trials reported that interspecific fighting (between males) and it is suggested not to keep rabbits more than 70-day old on litter. All the above considerations also suggest that further research and studies are necessary in this direction in order to assess whether the finishing phase should continue on litter. As for the strictly financial aspects, it should be pointed out that the data collected, processed and discussed in this paper were purposely confined to the vital statistics strictly related to zootechny.

REFERENCES

1) Auxilia M.T., 1985. La tecnologia dell'allevamento cunicolo. Atti Congr. Tecn. Scient. Alessandria.

2) Crimella C., Verga M., Luzi F. e Canali E. 1988. Sistema di allevamento alternativo nell'ingrasso del coniglio. Riv. di Con. (on printing).

3) Finzi A., Gualtiero L. e Valentini A. 1986. Allevamento del coniglio all'aperto. Riv. di Con. n.2:47-49.

4) Gallazzi D., 1985. Allevamento e svezzamento del coniglio su lettiera permanente. Riv. di Con. n.12:36-38.

5) Gallazzi D. e Arrighi P., 1988. Allevamento del coniglio su lettiera permanente: aspetti sanitari. Riv. di Con. (on printing).

6) Grazzani S.e Dubini E., 1982. Coniglicoltura razionale. Ed. Ottaviano Roma.

7) Guadagno C., 1987. "Semi plain-air" e coniglicoltura moderna. Riv. di Con. n.4:16-22.

8) I.T.AVI., 1979. L'habitat du lapin. Cahier Technique de l'I.T.AVI.

9) Lebas F. 1983. Engraissement de lapins à l'extérieur-Résultats préliminaires. Cuniculture n.50 - 10(2).

10) Maertens L. e De Groote G., 1984. Influence of the number of fryer rabbits for cage on their performances. J. Rab. Res. vol.7,n.4:151-152.

11) Prawirodidgo S. et all. 1985. Effect of cage density on the performance of growing rabbits. J. Rab. Res. vol.8,n.2:85-86.

12) Ramina L., 1986. Quale gabbia per l'ingrasso? Riv. di Conigl. n. 2:21-25.

13) Roca T., Castellò y Camps J. 1980. Tratado de cunicultura, vol.2. Ed. Real Esc. Ofic. y Sup. de Avicultura - Barcellona.

14) Slotissek S. e Eissele K., 1986. Ingrasso dei conigli con diversa concentrazione di capi nella stessa gabbia. Sel. Vet. vol.XXVIII, n.1:71-74.

Table 1 — Feed composition

		(x ed D.M.)
Water	10.3	
Ether extract	17.8	19.8
Crude protein	2.7	3.0
Crude fiber	12.0	13.4
Ashes	8.6	9.6
N-free extract	48.6	54.2

Table 2 — Mean Daily Weight Gain (D.W.G.) per housing system in the three trials (day 35-77)

Housing system	D.W.G. (gm) I trial	D.W.G. (gm) II trial	D.W.G. (gm) III trial
Cage	25.50	26.91	34.78
Litter	25.91	27.56	21.00

Table 3 — Mean Daily Weight Gain (D.W.G.) per housing system in the three trials (day 35-81)

Housing system	D.W.G. (gm) I trial	D.W.G. (gm) II trial	D.W.G. (gm) III trial
Cage	42.00	29.74	23.30
Litter/cage	35.06	28.52	31.41

Table 4 — Mean Daily Weight Gain (D.W.G.) per housing system in the three trials (day 35-81)

Housing system	D.W.G. (gm) I trial	D.W.G. (gm) II trial	D.W.G. (gm) III trial
Cage	34.19	29.74	23.30
Litter	25.91	27.56	21.00
Litter/cage (with transportation)	32.21	27.25	29.19
Litter/cage (without transportation)	27.87	29.69	33.63

Table 5 Mean Feed Conversion Ratio (F.C.R.) per housing system in the three trials (day 32-59)

Housing system	F.C.R. I trial	F.C.R. II trial	F.C.R. III trial
Cage	4.2	4.2	4.6
Litter	3.6	3.7	3.8

Table 6 Mean Feed Conversion Ratio (F.C.R.) per housing system in the three trials (day 59-81)

Housing system	F.C.R. I trial	F.C.R. II trial	F.C.R. III trial
Cage	4.5	4.6	3.3
Litter/cage	5.2	5.2	8.9 *

* The anomalous value is to refer to the present pathology

Table 7 Mean Feed Conversion Ratio (F.C.R.) per housing system in the three trials (day 32-81)

Housing system	F.C.R. I trial	F.C.R. II trial	F.C.R. III trial
Cage	4.4	4.4	4.8
Litter	4.4	4.4	5.8

Table 8

Analysis of Variance to detect differences for variability source: choice of housing, area/rabbit, genetic strain, type of coccidiostat used and sex at the weight variable (II,V e VIII) in the three trials

Note: the missing values were not reported as not available or not logically computable

V.S.	Weights	I trial	II trial	III trial
Housing system	M2	n.s.	n.s.	****
	M5	* *	n.s.	****
	M8	---	****	* *
Area/rabbit	M2	* *	* *	****
	M5	****	****	****
	M8	---	n.s.	* *
Genetic strain	M2	---	****	---
	M5	---	****	---
Type of coccidiostat	M5	n.s.	---	* *
Sex	M2	n.s.	n.s.	n.s.
	M5	n.s.	n.s.	n.s.
	M8	---	n.s.	n.s.

n.s. = not significant

* * = moderate significant

**** = high significant

Table 9 — Mean Slaughter Performance (S.P.) per housing system in the three trials

Housing system	S.P. (%) I trial	S.P. (%) II trial	S.P. (%) III trial
Cage	57.9	56.7	57.7
Litter/cage	56.9	55.7	55.5

Table 10 — Mean Feed Conversion Ratio (F.C.R.) per genetic ty reared in the 2nd trial

	1st period (day 32-59)	2nd period (day 59-81)	Total
W.C.N. Hybrids	3.7	5.0	4.35
W.C.N. N.Z.W.	4.0	5.2	4.6

Diagram 1

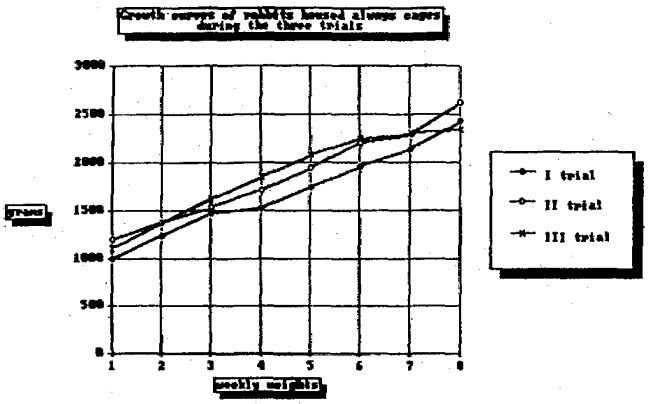


Diagram 2

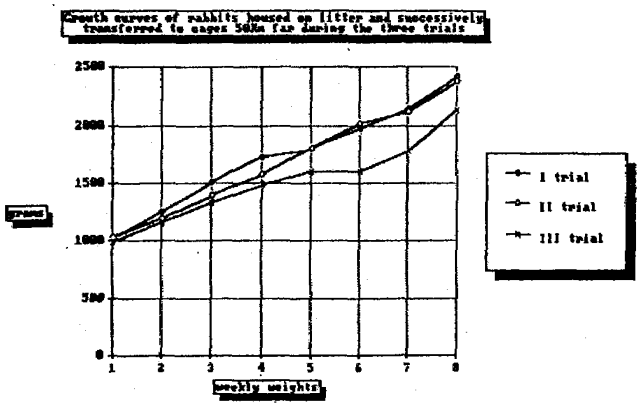


Diagram 3

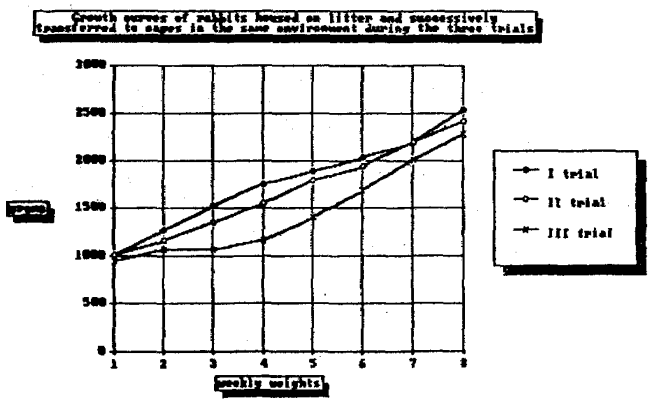
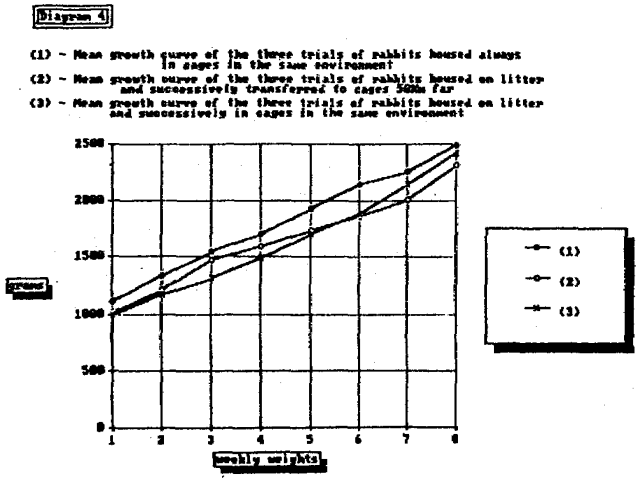


Diagram 4



Proceedings 4th World Rabbit Congress, 10-14 October 1988, Budapest Hungary, Vol. 1, 215-225

ALTERNATIVE HOUSING SYSTEMS IN MEAT RABBIT BREEDING

Crimella C., Luzi F. and Amboini M.*

* Institute of Zoot. Vet. - University of Milan

Aim of this research was to compare two different housing systems (litter vs. cage) in meat rabbit breeding. (3 trials)
600 hybrid rabbits were divided at weaning (30 days) in two groups (A and B) depending on the type of housing system and of genetic standard (2nd test): A(N=118)=rabbits reared in different density cages (1-2-3-4) according to respective square measures each one: cm2 1.000, cm2 500, cm2 700 and cm2 600; B(N=436)=rabbits reared in 6 groups on litter: every group disposed to cm2 850 each one. At 59 days, animals reared on litter, were removed to cages: 300, were transported for Km 50. Rabbits were individually weighted weekly and feed consumption was recorded for each experimental groups. Growth rates are statistically different (ANOVA) between the treatments and among the densities at the various ages considered; were analyzed average daily gain, feed conversion ratio and slaughtering also.
In conclusion the comparison between litter vs. cage rearing showed that the first is quite better till 2 months of age, while, afterwards cage density is an important variable.

SISTEMI ALTERNATIVI PER LA STABULAZIONE DEL CONIGLIO DA CARNE

Crimella C., Luzi F. e Amboini M.*

* Istituto di Zootecnica Veterinaria - Università di Milano.

La presente indagine ha inteso verificare la validità di differenti sistemi stabulativi nell'allevamento del coniglio da carne.
Si sono utilizzati 600 soggetti ibridi, suddivisi allo svezzamento, (30gg.), in 2 gruppi (A e B) in funzione della scelta stabulativa e per il tipo genetico di appartenenza (2a prova); A (N=118), posti in gabbie a differente densità (soggetti per gabbia: 1-2-3-4) con le seguenti rispettive superfici per capo: cm2 1.000, cm2 500, cm2 700 e cm2 600; B (N=436), posti in sei parchetti a terra: ogni gruppo aveva a disposizione cm2 850 a capo. All'età di 59 giorni, gli animali stabulati a terra sono stati trasferiti in gabbia: di questi, 300 hanno subito un trasporto supplementare di Km 50. Settimanalmente sono state effettuate pesate individuali ed è stato valutato il consumo medio di alimento per gruppo. Dalla analisi della varianza si sono rilevate differenze significative tra i due tipi di stabulazione e la densità relativamente al peso alle varie età considerate; si sono analizzati anche l'incremento medio giornaliero (I.M.G.), l'indice di conversione alimentare (I.C.A.) e la resa alla macellazione.
Il confronto ha evidenziato che la lettiera sarebbe consigliabile fino ai 60gg. di età, mentre successivamente la superficie per capo sarebbe un fattore di variabilità.