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EFFECT OF DIFFERENT WAYS OF CAGE ENRICHMENT ON THE PRODUCTIVE TRAITS AND MORTALITY OF FATTENING RABBITS

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ABSTRACT

Two ways of cage enrichment have been tested in comparison with a classical cage. In the first group, rabbits have access to a wooden stick and in the second they were given hay *ad libitum.* This trial was repeated twice and the productive traits and mortality of 264 rabbits per treatment were followed.
Average daily growth and average daily feed intake were not modified by the treatment. But the mortality of the rabbits of the wooden stick group was significantly higher than those of the two others (22.7 % *vs* 14.4 % for the rough forage group and 15.9 % for the classical one - p=0.0280). In a third repeat with, only, the two last treatments, a trend appeared to a higher mortality in the rough forage group (21,6 % vs 12,8 % - p=0,0946) at 71 days.
These results might be due to a higher level of contamination between rabbits inside the cages and we conclude that, as long as we can not control the Enterocolis, it would be better from a welfare point of view, not using this way of cage enrichment.

INTRODUCTION

There are a lot of criticisms of the modern housing of domestic species from a welfare point of view because animals are kept in barren environment. This is particularly the case of species which are bred in cages and the recent European regulation for laying hens has emphasised it.
There were just a few works about environment enrichment for rabbits. Huls and al. (1991 have showed that rabbits spent more than 90 % of their time chewing a wooden stick during the 50 minutes after they have been given access to it. But this trial was realised with just eight single-caged rabbits. Lidfors (1997) showed that the hay could be a better way of environmental enrichment but this trial was realised with only 10 old single-caged rabbits.
Furthermore, in the project of recommendation from the Council of Europe, it appeared necessary for some authors to give rabbits rough forage. But in the modern housing, this could be very difficult to do and it could appear some problem with the quality of the forage.
Because of these different points, we decided to test simultaneously the effect of enrichment with wooden stick and rough forage on the growth performance of the fattening rabbits.

MATERIAL AND METHODS

This trial was realised in the experimental station of ITAVI at Rambouillet (78). The rabbit of Hyplus genotype were housing in wire mesh cages of six animals at the stocking density of 17,4 rabbits/m².
At the weaning, the rabbits were divided in three experimental groups. In one group (WS) they have access to wooden stick of Douglas fir (200*45*25 mm) fixed on the side of the cage. In the second group, they were given rough forage (RF) which was a commercial hay placed in an internal wire mesh trough fixed on the cage's wall . In the third group (N), rabbits were reared with no enrichment object (control).

Three repeats of this trial were realised in November 1998, June 1999 and September 1999 (groups N and RF only). The rabbits were weaned at 36 days old and slaughtered at 71 but the final body weight was recorded at 68 days old for practical reasons. During the first part of fattening (14 or 21 days), they were given a commercial supplemented «wean» pellet and after a "finishing" one. The feeding program was modified after the first repeat because of the development of Enterocolis in January 1999. The details are given in table 1.

Table 1 : Feeding program, guaranteed value for the commercial pellets and analytical value for the hay during the three repeats

	«weaning» pellet	«finishing» pellet	hay (rough forage)
Repeat 1	CP : 16,4 % CF : 16,8 % Roxarsone : 50 mg Oxytétracycline : 400 mg Colistine : 66 mg 36 days to 47 days	CP : 16,5 % CF : 15,8 % 47 days to 68 days	CP : 7,7 % CF : 29,9 % NDF : 69,3 % ADF : 38,2 % ADL : 4,4 % 36 days to 68 days
Repeat 2	CP : 15,5 % CF : 18,5 % Apramycine 50 mg Bacitracine 100 mg 36 days to 54 days	CP : 16,5 % CF : 16,0 % 54 days to 68 days	CP : 7,7 % CF : 29,9 % NDF : 69,3 % ADF : 38,2 % ADL : 4,4 % 36 days to 68 days
Repeat 3	CP : 15,5 % CF : 18,5 % Apramycine 50 mg Bacitracine 100 mg 36 days to 54 days	CP : 16,5 % CF : 16,0 % 54 days to 68 days	CP : 9,9 % CF : 25,4 % NDF : 58,3 % ADF : 34,5 % ADL : 6,3 % 36 days to 68 days

The controls have consisted in weighing rabbits at 36 (weaning), 47, 54, 68 days old and recording feed intake. The mortality of rabbits was recorded daily from 36 to 71 days old. Weighs, average daily gain (ADG) and average daily feed intake (ADI) were treated with an analysis of variance where repeats and experimental groups were considered as fixed effects (Statview 5.0). The mortality was analysed by chi-square test. Because of the lack of the group WS in the third repeat, we have done two analyses : the first, with the two first repeats and the three groups and the second with the three repeats and groups N and RF only.

RESULTS

Analyse of the effects of the three treatments

The treatments have had no effect on the growth traits of the fattening rabbits (Table 2). The rabbits of the first repeat were significantly heavier at 68 days old than those of the second repeat (2504 g vs 2348 g - $p<0.0001$). This was expected as the first was conducted during winter and the second during summer. But this probably result of the development of Enterocolitis too.

In average, the rabbits have eaten 134.4 g/d during the whole fattening period (Table 2). It appeared a trend ($p=0.0848$) of an effect of the treatments with, particularly, rabbits of the RF group who ate 3.4 % less than rabbits of the WS group. In fact, the difference was near the significance level between 36 and 54 days old ($p=0.0512$) but not after probably because of a higher variability of the data.

Table 2 : Body weight (g), average daily gain (adg in g/d), average daily feed intake (adi in g/d) and food conversion ratio (FCR) in the three experimental groups - Analysis of the two first repeats (264 rabbits per treatment at the beginning)

	WS	RF	N	p under H0		
				Repeat	Housing	R*H
BW 36 d	1047±12.0	1040±10	1044±10			
BW 47 d	1543±19.0	1511±15	1523±18	<0.0001	0.27	0.23
BW 54 d	1866±18.9	1837±15	1861±19	0.0016	0.40	0.60
BW 68 d	2449±25.8	2414±24	2437±25	<0.0001	0.54	0.93
adg 36-54	45.5±0.6	44.2±0.7	45.4±0.8	<0.0001	0.32	0.63
adg 54-68	41.2±1.8	40.8±1.4	40.9±1.4	<0.0001	0.95	0.44
adg 36-68	43.8±0.6	42.9±0.6	43.5±0.6	<0.0001	0.59	0.88
adi 36-54	122.4±2.5	118.0±2.1	120.8±2.3	<0.0001	0.05	0.13
adi 54-68	155.4±3.7	149.1±3.3	152.6±3.9	<0.0001	0.48	0.23
adi 36-68	136.5±1.4	131.8±1.5	134.8±1.6	0.14	0.08	0.38
FCR	3.09±0.03	3.09±0.03	3.11±0.03	<0.0001	0.85	0.14

WS : wooden stick, RF : rough forage, N : nothing, Mean ± SEM

At last, the feed conversion ratio was not modified by the treatments.
The total mortality during the fattening period raised, in average, 15.4 % (Table 3). It was a very high level for the farm where the mortality was, in average, near 7 % in 1998. Of course, it was due to the Enterocolis even if, during the first repeat, we did not see any symptom. But we do not know the status of the animals as long as we do not know the causal agent of this disease. During the second repeat, Enterocolis was obvious and the mortality increased later, particularly when the rabbits were much than 65 days old and it seems to be a characteristic of this kind of mortality.

Table 3 : Mortality of the rabbits in the three experimental groups during the first two repeats

	Age	dead	Mortality		dead	Mortality		dead	Mortality		chi-sq.
	36 days *	264			264			264			
	47 days	14	5.3%		9	3.4%		7	2.7%		0.26
Together	54 days	25	9.5%		15	5.7%		17	6.4%		0.20
	68 days	53	20.1%	a	36	13.6%	b	33	12.5%	b	0.03
	71 days	60	22.7%	a	38	14.4%	b	42	15.9%	b	0.03
	36 days *	144			144			144			
	47 days	11	7.6%		7	4.9%		6	4.2%		0.40
Repeat 1	54 days	20	13.9%		12	8.3%		15	10.4%		0.31
	68 days	27	18.8%		19	13.2%		19	13.2%		0.31
	71 days	28	19.4%		19	13.2%		19	13.2%		0.24
	36 days *	120			120			120			
	47 days	3	2.5%		2	1.7%		1	0.8%		0.60
Repeat 2	54 days	5	4.2%		3	2.5%		2	1.7%		0.49
	68 days	26	21.7%	a	17	14.2%	ab	14	11.7%	b	0.09
	71 days	32	26.7%		19	15.8%		23	19.2%		0.11

WS : wooden stick, RF : rough forage, N : nothing,* Initial number of rabbits

When the rabbits were 68 and 71 days old, the difference between WS rabbits and RF and N rabbits were significant (p=0,034 and p=0,0280) with a higher level in the first group (22.7 %) than in the two others which were similar (14.4 % and 15.9 %) at 71 days.
These results were observed during the two repeats. But, the difference was only significant at 68 days during the second repeat between the WS group and the N group (21.7 % *vs* 11.7 % - p=0.0364) and decreased after.
Because of these results, we decided to stop the experiment with the wooden stick as we thought that this treatment did not improve the welfare of the rabbits. But during the second repeat, it appeared, too, that the mortality in the RF group was lower than in the N group, particularly at the end of the fattening period and it seemed to be interesting to realise a new trial to confirm this result as it could have some practical consequences.

Analyse of the three repeats with group N and RF only
If we take into account the whole experiment, there was no effect of the rough forage on the final body weight, the average daily gain or food intake and, of course, on the food conversion ratio (Table 4).

Table 4 : Body weight (in g), average daily gain (adg in g/j), average daily feed intake (adi en g/j) and food conversion ratio (FCR) in groups of rabbits with rough forage and without during the three repeats (366 rabbits per treatment at the beginning)

	RF	**N**	p under H0		
			Repeat	Housing	R*H
BW 36 d	1009±11	1006±12			
BW 47 d	1486±15	1491±16	<0.0001	0.80	0.40
BW 54 d	1812±15	1825±17	<0.0001	0.60	0.61
BW 68 d	2358±24	2376±24	<0.0001	0.43	0.95
adg 36-54	44.7±0.6	45.5±0.6	<0.0001	0.32	0.84
adg 54-68	38.9±1.2	39.4±1.1	<0.0001	0.60	0.49
adg 36-68	42.2±0.5	42.9±0.5	<0.0001	0.30	0.93
adi 36-54	118.3±1.7	120.4±1.7	<0.0001	0.20	0.48
adi 54-68	141.3±3.0	145.1±3.5	<0.0001	0.32	0.22
adi 36-68	128.5±1.5	131.2±1.5	<0.0001	0.19	0.81
FCR	3.07±0.02	3.07±0.02	<0.0001	0.94	0.49

RF : rough forage, N : nothing, Mean ± SEM

During the third repeat (Table 5), the mortality was higher in the RF group at 71 days old than in the N group (21,6 % vs 12,8 % - p=0,0946).

Table 5 : Mortality of the rabbits during the third repeat

	Age	**RF**		**N**		p under H0
		Dead	Mortality	Dead	Mortality	chi-sq.
Repeat 3	36 days*	102		102		
	47 days	3	2.9%	0	0.0%	0.08
	54 days	3	2.9%	0	0.0%	0.08
	68 days	19	18.6%	12	11.8%	0.17
	71 days	22	21.6%	13	12.7%	0.09

RF : rough forage, N : nothing, * Initial number of rabbits

This was contradictory with the result of the second repeat but it must be noted that the mortality increased sooner in the third one. Perhaps, during the second one, the result would evolved in a same way if we have kept the rabbits longer.

CONCLUSION

Cage enrichment with a wooden stick or by giving access to hay do not modified the fattening traits of the rabbits. We just observed a trend in a decrease of the feed intake and the growth rate of the rabbits which could eat hay (near 2 %) but this result was not significant. Even if we did not measure the hay intake because of the great loss of the stems through the wire mesh floor, we saw the rabbits really eating it. In fact, this was a practical problem because we have had to fill the trough very frequently (2 or 3 times per week) and the rabbits could easily dirtied the hay which lay on the floor cage (in two cages, they used it as a litter).

The wooden stick was easily gnawed by the rabbits but, in average, each animal has eaten 1,3 g during the whole fattening period. Nevertheless, the wood have induced a high level of mortality. Huls et al. (1991) did not obtain this result but there rabbits were single caged. So, we can make the hypothesis that in a collective cage, the risk of contamination by the oral way is higher as long as the rabbits have access to the same wooden stick. Recent works that deal with Enterecolis showed that the oral way is a very effective one to transmit the disease (Licois and al., 1999). This could explain why there were 9 cages with 3 or more dead rabbits in the WS group and only two in the N group.

But this hypothesis could also be proposed to explain the result of the RF group. We mentioned earlier that the hay could be dirtied by the rabbits and it is not impossible that some rabbits have sometimes eaten contaminated forage. We do not know but, on the contrary, this work show undoubtedly that giving hay to rabbits is not a safety measure when the Enterocolis is present in a farm.

In conclusion, from an ethologic point of view, some authors think that giving rabbits access to wooden stick or rough forage is a relevant management. However, our results show that, from the welfare point of view, it is not because of a higher level of mortality or a higher risk.

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