Proceedings of the

4-7 july **2000** – Valencia Spain

These proceedings were printed as a special issue of WORLD RABBIT SCIENCE, the journal of the World Rabbit Science Association, Volume 8, supplement 1

ISSN reference of this on line version is 2308-1910
(ISSN for all the on-line versions of the proceedings of the successive World Rabbit Congresses)

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Volume C, pages 459-465

EFFECT OF REDUCTION OF FEEDING TIME ON THE PERFORMANCES AND CARCASS QUALITY OF GROWING RABBITS

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ABSTRACT

288 Pannon White growing rabbits (weaned at 5 weeks of age) were allotted to 4 treatments. Controls were always fed *ad libitum* while three experimental groups had limited feeding time: 16 hours/day (16R), 14 hours/day (14R) and 12 hours/day (12R), respectively. The composition of the pelleted diet fed to the rabbits was 10.3 MJ/kg DE, 16.8 % crude protein, 14.1 % crude fibre and Zn-bacitracin 200 mg/kg, oxytetracycline 500 mg/kg and Diclazuril 1mg/kg was added as medication. With restricted feeding time daily feed intake decreased (C = 146 g, R16 = 135 g, R14 = 135 g, R12 = 134 g). The average daily weight gains recorded were 46.8, 46.3, 44.6 and 45.1g, respectively in the same order as above. The feed conversion of the experimental groups improved (C = 3.23, R16 = 3.11, R14 = 3.12, R12 = 3.10). Reduction in feeding time does not influence dressing percentage (61.4-61.8 %). On the basis of the results of this experiment a daily feeding time of 16 hours is recommended.

INTRODUCTION

The two most widely used methods for restricting daily feed intake are to decrease the quantity of feed provided and to reduce the length of time allowed for feeding. The disadvantage of the former procedure is that it is difficult to accomplish in practice and it is not possible to take account of the individual requirements of the animals. Where the latter method is used all the rabbits in each cage have the same access to the feed, and they can be restricted in their daily feed intake similarly, regardless of their weight or appetite.

SZENDRŐ *et al*. (1988) found that a daily feeding time of 12 hours was sufficient to ensure that growing rabbits attained weight gain similar to that of rabbits with *ad libitum* access to feed, while at the same time their feed intake decreased by 6 to 15 % and their feed conversion improved by 7 to 13 %. SCHLOLAUT and LANGE (1990), studying a stock characterised by more favourable weight gain and using a feeding time of 12 hours, observed 5 % lower weight at the age of ten weeks but 5 % better feed conversion than in the control group. In an experiment performed by JEROME *et al.* (1998) in which the rabbits were allowed to feed 16 hours per day, alongside a 4 % reduction in feed intake, weight gain and weight at 10 weeks also decreased by 4 to 5 %. CASTELLO and GURRI (1992), after barring fattening rabbits from access to feeders for 6 hours per day (i.e., using a feeding time of 18 hours), recorded no significantly less favourable data for a number of traits. On the other hand, when allowing rabbits access to feed 15 hours per day MCNITT and MOODY (1991) reported not only weight gain similar to that recorded for the control rabbits but also 8 % better feed conversion.

The various findings obtained in such experiments indicate that it is unequivocal that feed intake and feed conversion rate are reduced by 5 to 10 % when rabbits have access to feed for only 12 to 16 hours per day, but in certain experiments a deceleration in weight gain and a decrease in body weight have been observed.

In previous experiments (SZENDRŐ *et al*., 1988) the NZW rabbits under investigation gained weight at 30 to 34 g per day. Pannon White rabbits, which have now been subject to selection for more than 10 years, have the capacity for weight gain above 40 g per day (SZENDRŐ *et al.*, 1997). In the present experiment the authors sought to establish how many hours' access to feed per day is optimal to enable rabbit stocks capable of faster growth to attain the most favourable growth and slaughter data possible.

MATERIAL AND METHOD

Pannon White rabbits of both sexes were used in the experiment. The experimental animals were housed in a closed building, placed per 3 in flat-deck cages constructed of spot-welded wire mesh (floor dimensions 500 x 325 mm). A total of 288 growing rabbits weighing between 900 and 1050g, weaned at five weeks, were allocated to the following groups at random.

C = control group with unrestricted feeding time (24 hours a day) (n=72)
R12 = feeding allowed at night (8 p.m. to 8 a.m.), feeders closed off at other times (n=72)
R14 = feeding allowed from 8 p.m. to 10 a.m. (n=72)
R16 = feeding allowed from 8 p.m. to 12 noon (n= 72)

Throughout the experimental period the rabbits were fed a commercially available medicated rabbit feed (DE 10.3 MJ/kg, CP 16.8 %, Cfat 2.9 %, CF 14.1 %, ash 7.9 %, Ca 10.8 g/kg and P 5.8g/kg; medicinal components: Zn-bacitracin 200 mg/kg, oxytetracycline 500 mg/kg and Diclazuril 1 mg/kg). Drinking water was available *ad libitum*.

The experimental conditions were maintained until the rabbits reached the age of 10 weeks. Feed intake per cage and individual live weight were recorded once a week. At the end of the experimental period measurements were taken from the live rabbits by means of EM-SCAN equipment with an examination tube of 203 mm diameter (SA-3203); for this procedure the rabbits were anaesthetised and spead out in such a way as to ensure identical body length. Five E values were recorded for each animal, the average of these values being used in the calculations (EM-SCAN model SA-3000, operator's manual, 1996). A total of 25 males per group, weighing between 2.6 and 3.0 kg, were then fasted for 24 hours prior to slaughter, after which the carcasses were divided according to the method developed by BLASCO *et al*. (1993). The individual body parts were weighed and the whole body was subsequently ground twice; 100 g samples were taken from the resulting homogeneous mass and stored at –20°C prior to chemical analysis. Crude fat content was determined by means of Soxhlet ether extraction.
One-way analysis of variance (SPSS FOR WINDOWS 95, 1996) was used for the statistical evaluation of the experimental data.

RESULTS AND DISCUSSION

Feed intake

By the effect of feeding restriction feed intake in all three experimental groups was significantly ($P<0.05$) lower than in the control group in the first week (*Table 1*). This can be attributed to the rabbits not yet being used to having less time for feeding. In the second week groups R12 and R14 differed significantly ($P<0.05$) in feed intake from group C; in the 4th week all three experimental groups; and in the final week only group R14. Between the ages of five and ten weeks the rabbits of the experimental groups showed 5 to 8 % lower feed

intake (P<0.05) than the control group. It can be observed from the data that, although not always significantly, daily feed intake decreased with a reduction in the length of feeding time allowed. These findings are similar to others reported in the literature (SZENDRŐ *et al*., 1988; SCHLOLAUT and LANGE, 1990; MCNITT AND MOODY, 1991; JEROME *et al.*, 1998). That is to say, an appropriate degree of restriction in feed intake can be achieved by means of a properly planned reduction in feeding time.

Table 1

Effect of restricted feeding on daily feed intake (g)

Age (weeks)	Experimental groups				Overall	
	C	R16	R14	R12	Mean	SEM
n	69	66	66	66	267	-
5-6	108^{a}	97^{c}	86^{b}	87^{b}	95	1.9
6-7	139^{a}	135^{ab}	133^{b}	131^{b}	135	1.0
7-8	153	152	148	147	150	1.1
8-9	164^{a}	152^{bc}	153^{c}	146^{b}	154	1.3
9-10	167^{a}	161^{a}	153^{b}	160^{ab}	160	1.4
5-10	**146^{a}**	**140^{cd}**	**135^{bd}**	**134^{b}**	**139**	**1.0**

Different letters in the same row denote significant difference at P<0.05 level

Weight gain and body weight

Due to the sudden decrease in nutrient intake the daily weight gain of the rabbits in the experimental groups showed its largest decline in the week subsequent to weaning (*Table 2*). It seems that in the following week the rabbits which were allowed to feed only for restricted periods attempted to compensate for their deficiency, as all three groups were found to have gained more weight (group R12 significantly more) than group C. Throughout the fattening period (i.e., from the 5th to the 10th week of life) the weight gain of the rabbits of groups R16 and R12 proved similar to that attained in group C; only the rabbits of group R14 lagged behind those fed *ad libitum* with respect to weight gain. These findings provide evidence that, contrary to observations made in previous studies (SZENDRŐ *et al*., 1988), a feeding period of 12 hours is not sufficient: rabbits require at least 16 hours' access to feed per day to enable daily weight gain above 40 g to be achieved. Similar results were reported by MCNITT and MOODY (1991), while JEROME *et al.* (1998) found that weight gain in rabbits subjected to feeding restriction decreased by 4 to 5 %.

The average weight of the control group rabbits at 10 weeks was 2.60 kg, that of experimental groups R16, R14 and R12 2.59 kg, 2.53 kg and 2.55 kg respectively. It means the rabbits in groups R14 and R12 need 1 or 2 days more to reach the same weight as control.

Table 2

Effect of restricted feeding on daily weight gain (g)

Age (weeks)	Experimental groups				Overall	
	C	R16	R14	R12	Mean	SEM
n	69	66	66	66	267	-
5-6	54.1^{a}	50.4^{ac}	46.4^{bc}	45.4^{b}	49.1	0.93
6-7	51.6^{a}	52.8^{a}	52.6^{a}	56.8^{b}	53.4	0.50
7-8	46.3	47.7	47.0	46.6	46.9	0.48
8-9	41.6^{a}	40.2^{ab}	39.5^{ab}	38.5^{b}	40.0	0.51
9-10	40.5^{a}	40.4^{ab}	37.5^{b}	38.4^{ab}	39.2	0.55
5-10	**46.8^{a}**	**46.3^{ab}**	**44.6^{b}**	**45.1^{ab}**	**45.7**	**0.33**

Different letters in the same row denote significant difference at P<0.05 level

Feed conversion

Between the 5th and the 6th week group R14 attained significantly (P<0.05) better feed conversion than group C, while between the 6th and the 7th week this was true of all three experimental groups (*Table 3*). There was no longer any statistically verified difference between the groups in the latter stages of the fattening period. Between the 5th and the 10th week the rabbits which were allowed to eat for between 12 and 16 hours per day consumed 3 to 4 % (P<0.05) less feed per kg weight gain than those of the control group. This improvement in feed intake is not as substantial as that observed in a previous study (SZENDRŐ *et al*., 1988), but conforms with the findings of most other authors.

Table 3

Effect of restricted feeding on feed conversion (g/g)

Age (weeks)	Experimental groups				Overall	
	C	R16	R14	R12	Mean	SEM
n	69	66	66	66	267	-
5-6	2.00^{a}	1.92^{ab}	1.86^{b}	1.94^{ab}	1.93	0.016
6-7	2.71^{a}	2.57^{c}	2.55^{c}	2.31^{b}	2.54	0.024
7-8	3.32	3.20	3.18	3.18	3.22	0.031
8-9	3.95	3.83	3.94	3.86	3.89	0.044
9-10	4.16	4.04	4.06	4.22	4.12	0.050
5-10	**3.23^{a}**	**3.11^{b}**	**3.12^{b}**	**3.10^{b}**	**3.14**	**0.020**

Different letters in the same row denote significant difference at P<0.05 level

Mortality

The only instances of mortality recorded during the experimental period were two rabbits in group R14. The reason for this extremely favourable mortality rate is not to be sought in the treatments under investigation, but can be attributed to the medicated rabbit feed used.

Slaughter traits and body composition

There was not total concurrence in body weight prior to slaughter between the experimental groups, and it is to this that the significant differences between the weights of certain carcass parts can be attributed (*Table 4*). The data indicating enlarged liver are quite conspicuously apparent. Similar findings were reported by SCHLOLAUT *et al.* (1978) and CHRIST and LANGE (1997) for various degrees of feeding restriction (in the domain of 60-70-80 %). No

significant difference was ascertained with respect to dressing percentage calculated on the basis of the various aspects, nor in the ratio of the fore, intermediate and hind parts in relation to body weight or carcass weight (*Table 4*). JEROME *et al.* (1988) reported similar findings, while CASTELLO and GURRI (1992) recorded a significant reduction in dressing percentage. In this study the quantities of the fat depots in the experimental rabbits and the ratio of these depots in relation to body weight were slightly (but not significantly) lower, and whole body fat content significantly lower, than the corresponding data recorded for the control group. This difference proved not to be verifiable with the TOBEC method (for E value). The data to be found in the literature correspond entirely from the aspect that the more substantial the degree of feeding restriction applied, the smaller the quantity of fat deposited in the animal (CHRIST and LANGE, 1997; SCHLOLAUT *et al.*, 1978; PERRIER, 1998; PETERSEN, 1995).

Table 4

Effect of restricted feeding on slaughter traits and fat content of the body

Trait	Experimental group				Overall	
	24	R16	R14	R12	Mean	SEM
No. of rabbits	27	23	25	25		
Live weight, g (before fasting)						
Live weight, g (after 24 h fasting)	2593^{b}	2603^{b}	2540^{a}	2511^{a}	2562	10
Weight loss, g (during 24 h fasting)						
Head weight, g	134	134	134	136	135	1.1
Distal part of legs weight, g	92	94	94	95	94	0.7
Full gastrointestinal tract weight, g	376	381	386	396	385	4.2
Liver weight, g	69.0^{b}	81.2^{a}	76.4^{a}	75.4^{ab}	75.3	1.28
Kidneys+heart+lungs weight, g	46.0	47.4	47.9	46.8	47.0	0.51
Scapular fat weight, g	8.4	8.4	7.5	7.3	7.9	0.22
Kidney fat weight, g	24.3	20.4	21.7	21.0	22.0	0.82
Hot reference carcass weight, g	1318^{b}	1318^{b}	1281^{a}	1273^{a}	1298	6
Fore part weight, g	417^{b}	418^{b}	404^{a}	401^{a}	410	2.3
Intermediate part weight, g	416	412	405	404	409	2.6
Hind part weight, g	486^{b}	488^{b}	472^{a}	468^{a}	479	2.6
Hind legs weight, g	457^{b}	458^{b}	444^{a}	439^{a}	450	2.4
Dressing percentage (without head and edible parts), %	50.8	50.7	50.4	50.7	50.7	0.16
Dressing percentage (with head, without edible parts), %	56.0	55.8	55.7	56.1	55.9	0.18
Dressing percentage (without head, with edible parts), %	55.3	55.6	55.3	55.6	55.4	0.14
Dressing percentage, % (with head and edible parts)	60.4	60.8	60.6	61.0	60.7	0.16
Ratio of fore part in live weight, %	16.1	16.1	15.9	16.0	16.0	0.08
Ratio of intermediate part in live weight, %	16.0	15.8	15.9	16.1	16.0	0.08
Ratio of hind part in live weight, %	18.7	18.7	18.6	18.7	18.7	0.08
Ratio of fore part in carcass, %	31.6	31.7	31.6	31.5	31.6	0.13
Ratio of intermediate part in carcass, %	31.5	31.3	31.6	31.7	31.5	0.11
Ratio of hind part in carcass, %	36.8	37.0	36.8	36.8	36.9	0.09
Ratio of hind legs in carcass, %	34.7	34.7	34.6	34.5	34.6	0.09
Ratio of scapular fat in live weight, %	0.33	0.32	0.30	0.29	0.31	0.008
Ratio of kidney fat in live weight, %	0.94	0.78	0.86	0.84	0.86	0.033
Crude fat content of the body, %	11.3^{b}	10.0^{a}	9.9^{a}	9.7^{a}	10.2	0.17
E value	1641^{ab}	1720^{b}	1628^{a}	1617^{a}	1650	16

Different letters in the same row denote significant difference at P<0.05 level

CONCLUSIONS

On the basis of the data obtained in this experiment it can be established that, when a high daily weight gain (above 40 g/day) is required, 12-hour daily access to the feed is not sufficient. This is in contrast to the findings of our previous study; the reason for this being that the resulting 4 % improvement in feed conversion is accompanied by a 4 % deterioration in weight gain. With a feeding period of 16 hours it may be anticipated that, while feed intake will be reduced by 4 to 5 %, there will be no change in weight gain. The applied feeding restrictions exerted no influence on dressing percentage, or on the ratio of the fore, intermediate and hind parts, but leads to an increase in the weight of the liver and a decrease in whole body fat content.

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