GROWING RABBIT MANAGEMENT: HOUSING SYSTEM, REDUCTION OF EATING TIME AND FEEDER SPACE

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Abstract - One hundred and thirty three weanling New Zealand White (NZW) rabbits were used in this investigation through three experiments under Egyptian winter climate. The first one aimed to compare between the effect of housing systems (cages *vs* floor); the second trial aimed to study the effect of restricted feeding by reducing the feeding time 12 hours either night or day and the third trial aimed to study the effect of various spaces (6 or 10 cm) specified on the feeder trough for each rabbit, on growth performance and economical efficiency from weaning to meat marketing age.

Raising NZW rabbits (5-12 weeks) of age on the floor reduced significantly ($P<0.05$) body weight and weight gain at marketing age and increased mortality rate and feed conversion than that rabbits reared in battery cages.

Feeding NZW rabbits from 4-12 weeks of age 12 hours nightly/day (18:00-06:00) reduced significantly ($P<0.01$) live weight at 8 and 12 weeks of age, weight gain form 4-8 and 4-12 weeks of age as compared with that rabbits fed 24 hrs/day or 12 hrs daytime/day (06:00-18:00). The best feed conversion (3.52) and economical efficiency (296.8%) were obtained with the group of rabbits which fed for 12hrs during the daytime than (3.92 and 3.93) feed conversion and (257.5 and 256.3%) economical efficiency for rabbits fed 24 12 hrs nightly/day, respectively.

Concerning the feeder space which specified for each rabbit (6 *vs* 10 cm), there were no significant ($P<0.05$) differences between the two groups in all studied traits.

INTRODUCTION

Much of rabbits raising is an art and success depends on the ability of the manager to understand the rabbitry management.

One of the way to keep production costs of intensive rabbit breeding low is to consider an alternative housing to the traditional housing, which should allow an equal performance levels for low investment costs. The traditional cage breeding can produce stress in animals (METZ, 1987 ; DRECHER, 1992), which can reflect an adaptive behaviour, possibly also influencing as well physiological and productive aspects (MORI and BAGLIACCA, 1985 ; PODBERSCHEK *et al.* 1991 ; STAUFFACHER, 1992.; BROOM and JOHNSON, 1993 ; WIEPKEMA and KOOLHASS, 1993).

Also, the *ad libitum* feeding is widely applied both under large scale and small farming rabbit breeding conditions. Some studies on the application on restricted feeding have been initiated in rabbit breeding (LEBAS, 1975 ; LEBAS and LAPLACE, 1980 and 1982 ; LENDIN 1984). SZENDRO *et al.* (1988) found that growing rabbits require 12 hrs or less, but more than 8 hrs daily to eat their feedstuff requirements.

Inadequate feeder space is generally associated with nonuniformity of poultry body weight (HUGHES and BLACK, 1977).

The objectives of this study were to measure the effects of cage *vs* floor rearing, reduction of eating time and rearing feeder space, on growth, feed consumption, feed efficiency and economical efficiency of NZW rabbits.

MATERIALS AND METHODS

The present study was carried out at the Rabbit Research Unit, Institute of Efficient Productivity, Zagazig University, Zagazig, Egypt from December 1994 to February 1995.

A total number of 88 NZW growing rabbits aged 5 weeks were used in Trial 1 (40 rabbits) and in Trial III (48 rabbits) and 45 weanling NZW rabbits aged 4 weeks were used in Trial II.

Trial I aimed to compare between the effect of housing systems either in wired batteries provided with feeders and automatic drinkers or on the floor provided with sawdust and pottery feeders and drinkers. Forty weanling NZW rabbits nearly equal in the average body weight were randomly divided into two groups, the first group (20 rabbits) housed each 4 rabbits into wired cage (50 x 45 x 40cm) and the second group (20 rabbits) housed on 225 x 50cm of floor to give the same area per rabbit.

Trail II aimed to study the effect of restricted feeding by reducing the feeding time 12 hours either at night or day. Forty five growing NZW rabbits 4 weeks old and nearly equal in body weight were divided into 3 groups (15 rabbits each). The first group served as control group which fed *ad libitum* day and night (24 hrs/day), the

Table 1 : Ingredients and chemical analysis of the commercial pelleted ration

Ingredients	%
Barley grains	32.00
Wheat bran	21.00
Berseen hay	28.00
Soybean meal	10.00
Decorticated cotton seed meal	3.00
Molasses	3.00
Limestone	1.00
Meat meal (60 % CP)	1.35
Sodium chloride	0.25
Vitamin and mineral premix*	0.30
Dl-methionine	0.10
Total	100.00
Chemical analysis	**%**
Crude protein (CP)	16.15
Digestible energy (DE) Kcal/kg feed	26.22
Ether extract (EE)	2.71
Crude fibre	13.60

* : Each kilogram contains: Vit. A 2.000.000 IU, Vit. D3 150,000IU, Vit.E 8.33g, Vit. K 0.33g, Vit. B_1 0.33g, Vit.B_2 1.0g, Vit.B_6 0.33g, Vit.B_{12} 1.7 mg, Vit.B_5 8.33g, Pantothenic acid 3.33g, Biotin 33mg, Folic acid 0.83g, Choline chloride 200g, Zn 11.79 g, Mn 5g, Fe 12.5g, Cu 0.5, I 33.3mg, Se 16.6mg, Mg 66.79.

second group fed *ad libitum* from 18:00-06:00 (nightly), while the third group fed *ad libitum* from 06:00-18:00 daytime.

Trial III aimed to study the effect of various spaces specified on the feeder for each rabbit from weaning (5 weeks) up to marketing age (12 weeks). Forty eight weanling NZW rabbits were divided into two equal groups, the first group (24 rabbits) were housed into 6 cages (4 rabbits each), provided with feed troughs (24cm length and 7cm width each), the same was done for the second group, but another feed trough (16cm length and 7cm width) was added for each cage to permit 10 cm area for each rabbit rather than 6cm in group I.

All rabbits were reared under the same managerial and hygienic conditions.

Composition and chemical analysis of the experimental diets are presented in Table I. The diet was analysed according to A.O.A.C. (1980), but digestible energy was calculated according to N.R.C. 1977.

The rabbits and consumed feed were weighed weekly and weight gain and feed conversion was estimated. Economical efficiency (Y) at 12 weeks of age was calculated according to the following equation:

$Y = [A-B)/B] \times 100$ where: A is the selling cost of the obtained gain and B is the feeding cost of this gain.

The results subjected to statistical analysis according to SNEDECOR and COCHRAN (1982). The following model was used for each trial:

$Y_{ij} = U \pm t_i \pm e_{ij}$ where : e_{ij} = Random error ; U = Overall mean, t_i = Effect of treatment.

Difference among treatments were tested statistically with Duncan's New Multiple Range test (1955).

RESULTS AND DISCUSSION

Housing systems

Results presented in Table 2 show the effect of the two housing systems (cage *vs* floor) on the growth performance of New Zealand White rabbits (NZW).

Raising NZW rabbits from weaning (5 weeks age) up to marketing age (12 weeks age) on the floor reduced significantly ($P<0.05$) body weight at marketing age.

CRIMELLA *et al.* (1988) suggested not to keep rabbits more than 70 days old on litter. Average gain was significantly ($P<0.05$) higher in rabbits reared in cage than those reared in floor pens (Table 2). CRIMELLA *et al.* (1988) found that daily gain was 34.19g and 25.91g for rabbits reared in cages and floor pens during 32 to 81 days of age, respectively. Reduction (6.4%) in daily feed consumed by the rabbits raised on the floor as compared with that raised in cages was observed in the present study. It might be due to the weakness status which appeared on the rabbits reared on the floor which reflected on more mortality (15%) than 5% for rabbits reared in cages. As consequence feed conversion of that rabbits which grew on the floor were higher from 5-8, 8-12 and 5-12 weeks of age when compared with the values of the rabbits grew in cages at the same periods. CRIMELLA *et al.* (1988) found that values of feed conversion were better for rabbits reared in cages. Economical efficiency % was higher for cage rabbits than floor rabbits (Table 2). Thus, weanling rabbits which used to go out the nest (from the 18^{th} day of age to 35^{th} day when weaned) behind their mothers in the cages not advisable to complete their growing up to marketing age on the floor.

Reduction of eating time

Results of restricted feeding by reducing the feeding time of growing NZW rabbits 12 hours (either From 06:00-18:00 or 18:00-06:00) are presented in Table 3.

Table 2 : Effect of housing system (cages or floor) on performance of NZW growing rabbits.

Traits	Housing system Cages	Floor
Initial number of rabbits	20	20
Final number of rabbits	19	17
Mortality rate %	5	15
Body weight (g) at :		
5 weeks	610 ± 27	614 ± 28
8 weeks	1201 ± 44	1086 ± 50
12 weeks	1935^{a} ± 54	1716^{b} ± 62*
Weight gain (g) :		
5-8 weeks	594^{a} ± 22	463^{b} ± 32**
8-12 weeks	717^{a} ± 38	600^{b} ± 25*
5-12 weeks	1321^{a} ± 39	1080^{b} ± 44**
Daily feed consumption (g) :		
5-8 weeks	82.0	78.0
8-12 weeks	110.7	102.7
5-12 weeks	98.4	92.1
Feed conversion :		
5-8 weeks	2.90	3.55
8-12 weeks	4.33	4.80
5-12 weeks	3.65	4.19
Economical efficiency %	283.5	235.0

a,b Means in the same row with different superscripts differ significantly (P<0.01 or 0.05). * P<0.05 ** P<0.01
Cost of one kilogram of pelleted diet and live rabbit = 0.50 and 7.00 L.E., respectively.

Table 3 : Effect of restricted feeding (by reducing the feeding time 12 hours either night or day) on performance of NZW growing rabbits.

Traits	Feeding system 24 hrs	18:00-06:00 nightly	06:00-18:00 daytime
Initial nb. of rabbits	15	15	15
Final nb. of rabbits	14	14	14
Mortality rate %	6.76	6.67	6.67
Body weight (g) at :			
4 weeks	504 ± 22	498 ± 23	494 ± 19
8 weeks	1236^{a} ± 29	1088^{b} ± 40	1283^{a} ± 42**
12 weeks	1857^{a} ± 10	1672^{b} ± 51	1855^{a} ± 41**
Weight gain (g) :			
4-8 weeks	729^{a} ± 13	592^{b} ± 24	788^{a} ± 26**
8-12 weeks	621 ± 24	584 ± 27	572 ± 29
4-12 weeks	1350^{a} ± 18	1175^{b} ± 39	1359^{a} ± 36**
Daily feed consumption (g) :			
4-8 weeks	74.7	66.0	70.3
8-12 weeks	144.0	98.9	100.9
4-12 weeks	94.4	82.5	85.6
Feed conversion :			
4-8 weeks	2.87	3.13	2.50
8-12 weeks	5.14	4.73	4.95
4-12 weeks	3.92	3.93	3.52
Economical efficiency %	257.5	256.3	296.8

a,b Means in thesame row with different superscripts differ significantly (P<0.01) ** P<0.01
Cost of one kilogram of pelleted diet and live rabbit = 0.50 and 7.00 L.E., respectively.

Feeding NZW rabbits from 4 to 12 weeks of age *ad libitum* 12 hours only (from 18:00 to 06:00 nightly) reduced significantly (P<0.01) live weight at 8 and 12 weeks of age, weight gain from 4-8 and 4-12 weeks of age as compared with that rabbits fed *ad libitum* 24 or 12 hours (from 06:00 to 18:00 daytime) a day. No significant differences in live body weight between rabbits eating continuously (for 24 hrs daily) or eating between 06:00 and 18:00 daytime throughout the experimental periods. Similar findings were obtained by SZENDRO *et al.* (1988).

A reduction (12.6 and 3.6%) in the daily feed consumed by rabbits fed 12 hrs (18:00-06:00) or (06:00-18:00), respectively than that rabbits fed 24 hrs a day. SZENDRO *et al.* (1988) found that rabbits eating for 24 hrs daily were significantly (P<0.05) consuming more (108.79g) feed than those eating for 12 hrs daily (102.66g) during 4-12 weeks of age.

The best feed conversion (3.52), however was obtained with group of rabbits fed for 12 hrs during the daytime through the fattening period 4-12 weeks of age (Table 3). Results obtained agree with the findings of SZENDRO *et al.* (1986 and 1988).

Morality rate was identical in the three experimental groups. The higher value of daily feed consumed of the first group in the present study which fed 24 hrs/day than the other two groups which fed only 12 hrs/day is logic, but the high value of daily feed consumed of the third group (fed from 06:00-18:00) than the second group (fed from 18:00-06:00) might be due to the fact which was mentioned by LEBAS *et al.* (1986) that the intake of feed is very high just before the lights are switched off and the feeding habits of wild rabbits are even more nocturnal than those of domesticated rabbits. SZENDRO *et al.* (1988) also found that the peak consumption were observed at 07:00 and 19:00 o'clock.

Economical efficiency in the present study of feeding the rabbits only 12 hrs/day (from 06:00 to 18:00) was considered better than that recorded either for that rabbits

Table 4 : Effect of variable feeder space on growth performance of growing NZW rabbits

Traits	Feeder space/rabbit 6 cm	10 cm
Initial number of rabbits	24	24
Final number of rabbits	23	23
Mortality rate %	4.17	4.17
Body weight (g) at :		
5 weeks	561 ± 20	562 ± 19
8 weeks	1098 ± 34	1089 ± 38
12 weeks	1866 ± 38	1849 ± 34
Weight gain (g) :		
5-8 weeks	538 ± 28	526 ± 30
8-12 weeks	767 ± 34	758 ± 35
5-12 weeks	1301 ± 39	1285 ± 38
Daily feed consumption (g) :		
5-8 weeks	62.0	73.2
8-12 weeks	98.2	101.8
5-12 weeks	83,1	86.0
Feed conversion :		
5-8 weeks	2.43	2.92
8-12 weeks	3.58	3.75
5-12 weeks	3,13	3.28
Economical efficiency %	347.3	326.9

Cost of one kilogram of pelleted diet and live rabbit = 0.50 and 7.00 L.E., respectively.

fed 24 hrs or only 12 hrs (from 18:00 to 06:00)/day as it shown in Table 3.

Feeder spaces

Data of the density of rabbits on feeders subjected to statistical analysis and the results were tabulated in Table 4.

No significant differences ($P<0.05$) were obtained between the two experimental groups. Live weight and weight gain at 8 and 12 weeks of age were a little higher in the first group which had 6cm on feeder/rabbit than the second group which had 10 cm on feeder/rabbit. The daily feed consumed was also a little higher in the second group than the first one. ROBINSON (1979) showed depressed feed intake as feeder space was reduced for poultry. Consequently, the feed conversion from 5-12 weeks and economical efficiency of the first group which had 6cm on the feed trough/rabbit were better than those of the second group which had 10 cm length on the feed trough. Similar results was found by AHMED *et al.* (1991). Mortality rate in the present study was not affected by the feeder space allocation/rabbit.

The general conclusion which may be obtained is that, raising NZW rabbits from weaning (4 or 5 weeks) up to marketing age (12 weeks) is preferred on wired cages (batteries) and to fed 12 hrs only/day (from 06 to 18 o'clock) with 6cm length on the feed trough/rabbit during the winter season in Egypt climate.

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