

EFFECTS OF THE ENERGY LEVELS IN THE FEED AND THE FEEDING PROGRAM ON PERFORMANCES OF GROWING RABBITS

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Introduction

Rabbit growers know well that high temperatures in summer have an adverse effect on general performances, both on breeding behaviour, and on growing of kitlings. Despite these effects are more serious in the breeding house, when raising rabbits for meat it is known that feed intake is very severely affected also by ambient temperatures and, consequently, weight gains of kits.

During the last years a great interest has been shown on the possibility of feed restriction for growing rabbits in order to save feed and to improve performances. Several experiments have been reported on this subject by Lebas - 1975 -, Parigi-Bini et al. - 1978 -, Schlolaut et al. - 1978, mentioned by Lebas, 1991 -, Fekette and Gippert - 1981 -, Lebas and Laplace - 1980 and 1982-, Szendro et al. - 1988 -, Martens and Peeters - 1988 - and Castelló et al. - 1989 -. However, in some of these experiments rabbits were grown up to 2.3 to 2.5 kg and this is quite different from the average normal market weights in Spain - 1.9 to 2.1 kg -. And as in most of them, temperatures were not reported, we cannot know if the effect of a feed restriction program could be the same in winter or in summer.

Feed restriction could be linked also to the energy intake and/or to the energy of the feed. However, despite there are several reports on energy for growing rabbits - Costa Batllori, 1976 -; Susmel, 1979; Dehalle, 1980 - there is only one experiment studying both things - Castelló et al., 1989 -.

The aim of this paper has been to study the effect of a feed restriction program when used in combination with a high or a low energy diet with growing rabbits.

Materials and Methods

The experiment was conducted at four growing pens in the Experimental Farm of the "Real Escuela de Avicultura", at Arenys de Mar - Barcelona, Spain -. A total of 80 cages 61 x 64 cm were used, and each one was provided with a 19 cm-wide feeder and an automatic drinker.

560 crossed New Zealand x California kitlings were used in the experiment. They were weaned at 33-35 days of age and after being individually weighted - average weights ranged 700 to 900 g - they were placed at the growing cages - 7 kits per cage -. Each week, but one, 140 rabbits were started in the experiment and the first weaning was done on 12th June 1991.

The experiment was a factorial one, with 2 energy levels in the feed and 2 feeding systems, then allowing 4 treatments. Each treatment was replicated 20 times and each week 5 cages with 35 kitlings were started.

Rations used at the experiment are shown in table 1. The aim was to formulate 2 feeds as similar as possible, but with minimum changes in order to get a 150 Digestible Kcal./kg difference. Their calculated analysis are shown in table 2. They were manufactured as 3 mm pellets at a commercial feed mill and no other feed or roughage was supplied.

Half of the rabbits receiving each diet were ad libitum fed. The other half were not allowed to feed during 6 hours per day, from noon to 6 pm. It was done on placing an iron curtain on the front of each feeder.

Table 1. Composition of experimental diets.

Raw materials	High Energy	Low Energy
	%	%
Alfalfa, 16 % protein	40.0	40.0
Wheat bran	31.0	29.6
Barley, 2 rows	2.4	7.5
Carob meal	10.0	10.0
Sunflower, 30 % protein ..	10.0	9.3
Full-fat soybean oilmeal..	0.5	-
Lard	2.5	-
Salt	0.5	0.5
Calcium carbonate	0.8	0.8
Dicalcium phosphate	0.2	0.2
Binder	1.5	1.5
Vitamin-Mineral premix ...	0.5	0.5
L-lysine HCl	0.06	0.07

Table 2. Calculated annalysis of experimental diets.

	High Energy	Low Energy
Digestible Energy, Kcal/kg	2,550	2,400
Crude protein, %	15.00	15.00
Digestible protein, %	11.16	11.12
Crude fiber, %	13.85	13.76
Undigestible fiber, %	10.85	10.80
Starch, %	8.69	10.94
Sugars, %	6.91	6.83
Fat, %	5.12	2.59
Calcium, %	1.20	1.20
Phosphorus (total), %	0.50	0.50
Methionine, %	0.33	0.33
Methionine + Cystine, % ..	0.57	0.57
Lysine, %	0.63	0.63
Arginine, %	0.90	0.89
Isoleucine, %	0.61	0.61

Minimum and maximum temperatures were recorded daily and records were also kept on feed consumption and mortality during the experiment. The first batch of grown rabbits were finishing the experiment at mid July and the last one at the end of August, after 35 to 45 days of age. The decision to sell the rabbits come when the whole pen averaged near 2 kg liveweight. At this moment they were individually weighted and identified and they were brought to a processing plant to be weighted again after being killed, blooded, eviscerated and feet trimmed.

Results

All data collected were statistically annalyzed according to the procedure of Steel and Torrie - 1960 -.

Performances of the 20 replications of the 4 experimental groups are shown in table 3:

Table 3. Effects of 2 energy levels and feed restriction on performances of growing rabbits (*)

Treatments	Daily gain, g	Daily feed intake, g	g feed/ g gain	Carcass yield, %	Mortality %
High energy (HE), ad libitum (AL)	30.0	98.4	3.45	59.5	13.6
HE, restricted feeding (RF)	28.9	94.9	3.36	59.1	9.3
Low energy (LE), AL	28.7	94.5	3.45	58.9	10.7
LE/RF	26.4	86.1	3.36	57.7	10.7
HE, means	29.4	96.6	3.40	59.3 a	11.5
LE, means	27.5	90.3	3.40	58.3 b	10.7
AL, means	29.3	96.5	3.45	59.3 a	12.1
RF, means	27.6	90.5	3.36	58.4 b	10.0

(*) Means in the same row followed by a different letter are significantly different ($P \leq 0.01$)

Any significative difference between treatments was observed in the daily weight gain, the feed intake, the feed conversion and the mortality of the rabbits. However, a high significative difference was observed in the carcass yield, being higher in the rabbits fed the high energy diet and in those ad libitum fed. No interactions between energy/restriction were observed.

Discussion

As expected, the highest growth rate was observed in the groups of rabbits fed the high energy diet and the difference between these and the groups fed the low energy one was close to be significative. This is in agreement with our previous work - Castelló et al., 1989 - with ad lib. fed rabbits but not with restriction fed rabbits. The same results were obtained by other workers comparing different energy levels.

Daily weight gain of ad libitum fed rabbits was higher than weight gain of restriction fed rabbits and the difference between them was close to significance. This is almost the same result that we observed in the other experiment reported - 94 % and 96 % growth impairment - although in that case the feeding time per day was only 10 hours and now it has been 18 hours. However, the growth depression observed by Fekete and Gippert and by Schlolaut et al. was almost identical - 81 and 80 % respectively - despite the restriction used in their experiments - 84 % and 82 % - was much lighter than the restriction we applied. We think that this difference could be related to the much higher final weight in their experiments in comparison with our final weights.

It is striking that feed intake was higher with the high energy diet than with the low energy one, although the difference was not significant. This result is quite different with other reported experiments and the only explanation could be that the growing rabbit is not able to balance his feed intake according to the energy of the diet when temperature is very high. In this experiment, average daily minimum temperatures ranged from 19 to 22 °C and average maximum temperatures between 25 and 29 °C. In our previous experiment reported, differences in feed intake related to a 100 Dig. Energy/kg of diet ranged from 2 to 4 g per day but that trial was conducted in February-April, when temperatures ranged from 8 to 18 °C.

As diets were very carefully balanced in order to have the same levels of nutrients - mainly fiber, sugars and starch - but energy, we cannot find any other explanation to this striking difference regarding feed intake.

Feed restriction, as expected, depressed feed intake and this was close to be significant. But the feed depression observed in this experiment - 6 % - was lower than in our previous work - 12 % - as well as in the papers of Fekete and Gippert - 16 % - and Schlolaut et al. - 18 % -.

As a result of the pattern of growth gains and feed intake related to the energy of the diets, feed efficiency was exactly the same with the two energy levels. When we compared the feeding programs, the saving in feed per growth unit was very small - 3 % only in this experiment - and this is in agreement with our previous work, as well as with Schlolaut et al. and Fekete and Gippert, despite Szendro et al. reported a much higher saving - from 7 to 15 % -.

Mortality figures were not much different among the 4 treatments and could not be related to the energy of the diet or to the feeding program.

The very high significant differences found in the carcass yield related to the energy of the diet and to the feeding program were quite interesting. No interaction was observed between both factors and the effect of each one separately - 1 % - was not so big as the effect shown by Schlolaut et al. - 2.8 % -.

Conclusion

This report shows that a difference of 150 Dig. Energy/kg of feed, supplied to growing rabbits in hot weather, has had a very small influence on feed gains, as well as on feed intake. However, a very highly significant improvement was observed in carcass yield when the higher energy diet was fed.

The same results were observed when comparing an ad libitum feed program with a restricted one - 18 hours feeding per day -. Restriction depressed very slightly weight gains and feed intake, but not significantly. But a highly significant depression in carcass yield was observed among the fed-restricted rabbits.

Then, despite some reports showing that feed restriction could be interesting for growing rabbits, on the basis of these results and the time involved we would not recommend it.

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Summary

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An experiment was conducted in order to study the effects of the energy levels and the feeding program on the performances of growing rabbits. 560 cross-bred - New Zealand x California - kitlings were weaned at the same weight and they were placed in 4 identical pens, each one provided with 20 cages 61 x 64 cm. During four weeks 140 rabbits were started in the experiment, at 5 cages per treatment and 7 kits per cage.

A factorial design - 2 x 2 - was used: a) two energy levels in the feed - 2,550 and 2,400 Dig. Energy/kg feed -; b) two feeding programs - ad libitum feeding and not allowing to feed during 6 hours per day -. All the other management conditions were the same and the experiment was conducted in mid summer, with temperatures ranging from 19 to 29 °C.

The difference of 150 DE Kcal/kg of feed has had a very small influence on feed gains, as well as on feed intake and we think that this can be related to the hot weather conditions during the trial. However, a very highly significant improvement was observed in carcass yield when the higher energy diet was fed.

The same results were observed when comparing the ad libitum feed program with the restricted one. Restriction depressed very slightly weight gains and feed intake, but not significantly. But a highly significant depression in carcass yield was observed among the fed-restricted rabbits.