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volek.zdenek@vuzv.cz

The health status and growth performance of growing rabbits receiving either one or two diets during fattening period

Z. Volek[1], V. Skřivanová[1], M. Marounek[1,2]

[1]*Research Institute of Animal Production CZ-104 01 Prague 10, Czech Republic*
[2]*Institute of Animal Physiology and Genetics, Czech Academy of Sciences CZ-142 20 Prague 4, Czech Republic*

Introduction

Weanling rabbits are very susceptible to the development of digestive disturbances. A key role in the prevention of digestive troubles plays a correct supply of fibre fractions (Gidenne, 2003). The other important factor is a dietary level of starch in rabbits diets, mainly in the post-weaning period.
To ensure digestive security of the growing rabbit, it is recommended to maintain a dietary starch below 14% during post-weaning period, while during the finishing period, it is possible to level up the starch supply to 18%, without a major impact on the digestive security of the animals (Perez et al., 2000).
On the other hand, Gidenne et al.(2005) have studied the effects of quality of dietary starch on growth performance and mortality of rabbits. They have tried to maximise starch supply in the diets (20%), but they did not observe a significant effect on the digestive trouble incidence of the growing rabbit, neither in the post-weaning nor finishing period. Authors concluded that recommendations for a low starch level did not seem to prevent enteropathies.
Therefore, the aim of this study was to verify whether it is possible to use only one diet with 14% of starch for both post-weaning and finishing period or if it is necessary to decrease dietary level of starch immediately after weaning, thereby using two diets during fattening of rabbits. The effect of feeding either one or two diets on growth rate and health status of rabbit was evaluated.

Material and Methods

Animals, diets and recordings

A total of 240 rabbits, weaned at 35 days of age, were used for both growth rate and health status evaluation. Rabbits were divided into two groups. Rabbits, born in a commercial rabbitry, were kept in all-wire cages, two per cage.
Two diets (diet A and diet B) were formulated according to recent recommendation for rabbit feeding (Table 1) (Gidenne, 2000; Lebas, 2004). The diets were similar in the level of crude protein, fibre fraction and fat, but differed in the level of starch, and consequently digestible energy, as well as digestible protein/digestible energy ratio (Table 1).
The 1st group of rabbits received the diet A from weaning to slaughter at 77 days of age. The 2nd group of rabbits received diet B from weaning to 49 days of age, and then were fed with diet A till slaughter.
Diets and water were available *ad libitum*. Feed intake was measured weekly per group. Animals were individually weighed every week. Mortality was recorded every day; morbidity was recorded weekly. Health status was evaluated according to Gidenne et al. (2004). Briefly, morbidity corresponds to ill rabbits (but still alive within a period), showing digestive troubles (diarrhoea), or severe loss of weight during week, or an abnormally low growth. An animal was accounted morbid only one time (within period), even if diarrhoea lasted several days. The "Health Risk Index" was the sum of morbid and dead rabbits, knowing that each animal was accounted only once (classed either dead or morbid).
For growth rate evaluation, data only from healthy rabbits were used (initial number of rabbits at weaning minus morbidity and mortality) (Table 2).

Analytical methods and statistical analyses

Feed samples were air-dried at 105ºC to constant weight to estimate the dry matter content. Protein and fat concentrations were determined employing the Kjeltec Auto 1030 Analyser and Soxtec 1043 from Tecator AB (Sweden), respectively. Neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were determined according to the procedure of Van Soest et al. (1991), using Fibertec 2010. Water insoluble pectins, digestible energy, as well as digestible protein/digestible energy ratio were calculated from tables (Maertens et al., 2002). Digestible fibre was the sum of hemicelluloses (NDF-ADF) and water insoluble pectin (Gidenne, 2003). Starch was measured polarimetrically (Ewers procedure).
Effect of feeding either one or two diets during fattening period on growth performance was evaluated by the *t*-test. Data on mortality and morbidity were analysed using the χ^2 test. The statistical significance was declared at $P<0.05$.

Table 1 Ingredients (%) and chemical composition (g/kg) of the rabbits diets

	Diet	
	A	B
Ingredients, %		
Alfalfa meal	30	30
Extracted sunflower meal	13	15.5
Extracted soyabean meal	2	2
Wheat bran	26	27
Sugar beet pulp	4	4
Oats	6	8
Barley	14.5	9
Rapeseed oil	1.5	1.5
Vitamin supplement[1]	1	1
Dicalcium phosphate	0.5	0.5
Limestone	1	1
Salt	0.5	0.5
Chemical composition, g/kg		
Dry matter	910	911
Crude protein	167	168
NDF	362	372
ADF	193	199
ADL	60	63
Hemicelluloses (NDF-ADF)	169	173
Cellulose (ADF-ADL)	133	136
ADL/cellulose ratio	0.45	0.46
Pectins (water insoluble)[2]	49	51
Digestible fibre/ADF ratio	1.1	1.1
Starch	144	119
Ether extract	39	40
Nutritive value[2]		
Digestible energy, DE (MJ/kg)	10.0	9.6
Digestible protein, DP (g/kg)	115	121
DP/DE ratio (g/MJ)	11.5	12.5

[1] Per kg supplement: vitamin A-1 200 000 IU; vitamin D_3-200 000 IU; vitamin E-5 g; Vitamin K_3-0.2 g; vitamin B_1-0.3 g; vitamin B_2-0.7 g; vitamin B_6-0.4 g; niacinamide-5 g; Ca-pantothenate-2 g; folic acid-0.17 g; biotin-20 mg; vitamin B_{12}-2 mg; choline-60 g; lysine-25 g; DL- methionine-100 g; salinomycin 2.25 g.
[2]Calculated values

Results and Discussion

A higher feed intake in rabbits of the 2nd group before change of diet was observed (103.1 vs 118.8 g/d in rabbits of the 1st and 2nd group, respectively; table 2), which corresponds to an opinion that weaned rabbits regulate their feed intake according to dietary digestible energy level (e.g. Debray et al., 2002). For the whole fattening period, no differences in the feed intake were recorded.

During the initial phase of growth (from weaning to 49. days of age),the weight gain did not significantly differ between groups. However, during the finishing period, the weight gain was

significantly higher (P<0.05) as well as for the whole fattening period (P=0.10) in rabbits fed one diet only than in those fed two diets (Table 2)

Table 2 Growth performance of rabbits fed either one (1st group) or two diets (2nd group) during fattening period

	1st group	2nd group	*P*-level
Rabbits, n[1]	91	79	
Live weight, g			
at weaning, 35 d	907.1 ± 80,7	917.1 ± 80.4	NS
at 49. days of age	1418 ± 186.5	1450 ± 200.0	NS
before slaughter, 77d	2640 ± 235.6	2591 ± 233.0	NS
Weight gain, g/d			
35. – 49. day of age	36.5 ± 12.3	38.1 ± 14.0	NS
49. – 77. day of age	43.6 ± 7.8[a]	40.8 ± 8.72[b]	0.03
35. – 77. day of age	41.3 ± 5.4	39.9 ± 5.7	0.10
Feed intake, g/d			
35. – 49. day of age	103.1	118.8	-
35. – 77. day of age	164.4	171.2	-

Means ± SD
[1]n = initial number of rabbits at weaning (120 per group) minus mortality and morbidity
[ab] values in the same row with unlike superscript differ significantly (P<0.05)
NS – not significant

Table 3 Health status of rabbits[1] fed either one (1st group) or two diets (2nd group) during fattening period

	1st group	2nd group	*P*-level
Mortality, % (n)[2]			
35. – 49. day of age	4.2 (5)	5.0 (6)	NS
35. – 77. day of age	10.0 (12)	11.7 (14)	NS
Morbidity, % (n)			
35. – 49. day of age	5.0 (6)[a]	13.3 (16)[b]	0.01
35. – 77. day of age	14.2 (17)[a]	22.5 (27)[b]	0.01
Health Risk Index			
35. – 49. day of age	9.2 (11)[a]	18.3 (22)[b]	0.03
35. – 77. day of age	24.2 (29)[a]	34.2 (41)[b]	0.03

[1]120 rabbits per group at the beginning of the trial
[2]numbers of dead and ill rabbits are given in parentheses
[ab] values in the same row with unlike superscript differ significantly (P<0.05)

Mortality of rabbits was relatively low and no significant differences were recorded between groups (10.0 vs 11.7 % in rabbits of the 1st and 2nd group, respectively; table 3). However, both significantly higher morbidity and the health risk index were observed in rabbits of the

2nd group than in rabbits of the 1st group. Morbidity was caused mainly by diarrhoea. The highest increase of ill rabbits of the 2nd group was recorded before the change of diet. Then, the morbidity was similar between groups which means that the change of diet did not impair the health status of rabbits. Similarly, Gidenne et al. (2004) reported no negative effect of the change of diet on digestive health of early weaned rabbits in the post-weaning period.

CONCLUSION

From our results it seems that 14 % of starch in the diet for growing rabbits is suitable for both growth and good health status in the post-weaning and finishing period without a need to decrease dietary starch level (below this value) immediately after weaning.

It can be concluded that during fattening period is possible to use one diet only, without a negative effect on the health status and growth performance of growing rabbits

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