EFFECT OF A RABBIT DIET WITH SUGAR-BEET PULP ON GAINS, DIGESTIBILITY OF NUTRIENTS AND QUALITY OF RABBIT MEAT

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Rabbits were fed a diet with 20% of sugar-beet pulp (11 rabbits) or a control diet containing the same amount of fibre and digestible energy (11 rabbits). Rabbits fed sugar-beet pulp containing diet gained insignificantly more than control rabbits and consumed significantly more feed, feed protein and water. Digestibilities of hemicellulose and pectin were significantly lower in rabbits of the former group (32.8 vs 38.4% and 71.1 vs 82.3%, respectively). Digestion of other nutrients was not significantly affected by the type of diet. Slaughter parameters and the quality of meat were practically the same in both groups. It can be concluded that sugar-beet pulp incorporated at 20% level in rabbit feed is a suitable alternative to cereal grains and does not influence negatively performance and quality of meat.

rabbits; sugar-beet pulp

INTRODUCTION

Sugar-beet pulp represents an alternative to cereal grains and dehydrated lucerne in rabbit diets. It can be considered as a feed rich in digestible fibre and pectin, with high water-holding capacity. Owing to the uronic acids content, sugar-beet pulp binds cations. Sugar-beet pulp induces a retardation of intestinal transit (Gidenne et al., 1987). Incorporation of sugar-beet pulp in rabbit diet was followed by a significant increase of caecal weight and volatile fatty acid production (Peeters et al., 1995). Results of Cobos et al. (1995) indicated that barley may be substituted by sugar-beet pulp at levels up to 15% without bringing about adverse effects in feed efficiency, growth rate and chemical or fatty acid meat composition. In experiments of Garcia et al. (1993), sugar-beet pulp replaced 15% of barley grain without

decreasing growth performance, although energy and nitrogen efficiencies were impaired.

In this study, the effect of the total substitution of wheat and the partial substitution of barley in a rabbit diet by sugar-beet pulp on performance, digestibility of nutrients and quality of meat was investigated. Both diets examined contained the same amount of fibre and energy, but different amount of crude protein and pectin. The levels of dietary protein and pectin have been reported to influence serum cholesterol in farm animals (Oltjen, Dinius, 1975).

MATERIAL AND METHODS

Weaned rabbits, 30 days of age, of the Hyla 2000 breed were used. Rabbits were housed in all-wire cages, two per 0.66 m^2. Experimental conditions were the following: temperature – 16 °C, relative humidity – 55%, 12 : 12 h light : dark daily photoperiod cycle. Rabbits had *ad libitum* access to the diet P (with sugar-beet pulp) or the diet C (control). Nutritional variables of both diets are in Tab. I. Eleven rabbits per group were used.

Weights of rabbits, consumption of feeds and water were measured weekly. Three digestibility trials were performed on six rabbits (in the second, the fourth and the sixth week of the trial). Excreta were collected, pooled and recorded over 1 week and analyzed. The daily collections of faeces were treated by adding small amount of $CHCl_3$ and stored at 4 °C. Rabbits were killed at the age of 87 days. The variables measured included commercial carcass weight with head, dressing percentage, i. e. the proportion of commercial carcass with head + heart + liver + kidney + perirenal fat, from live weight and carcass weight components (hindquarter, loin, hindlegs, perirenal fat, skin). All rabbits, i. e. 11 animals in each group were used for these measurements.

Neutral detergent fibre (NDF) content in feeds and faeces was measured according to Van Soest and Wine (1967). Starch in faecal samples was hydrolyzed by amyloglucosidase and glucose released in this way was determined enzymatically using a commercial kit (Oxochrom Glucose, Lachema, Brno). In order to determine pectin in the feed, samples (3 g) were suspended in water (100 ml) and incubated at 25 °C overnight. Then 0.4 M HCl (100 ml) was added and the suspension was stirred at 80 °C for 1 h. Filtrate was diluted 1 : 5 with distilled water. Pectin from faecal samples was extracted with 1% solution of EDTA at 60 °C for 24 h. Again, filtrate was diluted 1 : 5 with water. Pectin in diluted extracts was determined according to Blumenkrantz and Asboe-Hansen (1973). Other analyses of feeds and faeces were done by standard AOAC (1980) procedures. The muscles of the hindleg

I. Main ingredients and chemical composition of rabbit diets C (control) and P (containing sugar-beet pulp)

Ingredients (%)	Diet	
	C	P
Barley	20	10
Oats	20	25
Wheat	10	–
Dehydrated lucerne	27	22
Extracted soya-bean meal	5	10
Sunflower meal	10	10
Sugar-beet pulp	–	20
Wheat bran	5	–
Vitamin-mineral supplement	3	3
Composition (g/kg)		
Dry matter	895	905
Crude protein	152	187
Crude fibre	131	130
NDF	266	262
ADF	173	175
Hemicellulose (NDF–ADF)	93	87
Starch	36.7	34.5
Pectin	14.0	16.7
Fat	48	24
Ash	60	69
Digestible energy (MJ/kg)	11.0	11.1

were homogenized and analysed for dry matter, protein, fat, and hydroxyproline contents. Dry matter was determined according to AOAC (1980), protein using the Kjeltec Auto 1030 Analyser (Tecator AB, Sweden) and fat using the Soxtec apparatus from the same firm. Hydroxyproline was determined after acid hydrolysis by the method of Diemair (1963) and cholesterol by means of a commercial kit (Lachema, Czech Republic). Apparent digestible energy of both diets was computed according to Wiseman et al. (1992). Gross energy value of samples of meat was computed from the fat and protein contents. The *t*-test was used for the evaluation of data.

RESULTS AND DISCUSSION

Rabbits fed sugar-beet pulp containing diet (P) gained insignificantly more than control rabbits (C). Feed consumption and intake of water were significantly higher in the former group (Tab. II). Consumption of feed per 1 kg of gain was insignificantly higher in rabbits fed diet P.

Consumption of feed protein (kg) per 1 kg of gain was 0.52 ± 0.04 and 0.68 ± 0.08 in rabbits fed diet C and P, respectively ($P < 0.01$). Digestibilities of hemicellulose and pectin were significantly lower in rabbits fed sugar-beet pulp. Differences in other parameters did not reach the statistical significance. Also differences in slaughter measurements and in meat quality data were not significant (Tab. III). Our results thus document that grain in a rabbit diet can be partially replaced by sugar-beet pulp, incorporated in the diet at 20%,

II. Performance, consumption of feeds, water and digestibility of nutrients in rabbits fed control (C) and sugar-beet pulp containing diet (P); means ± SD

Parameter	Diet	
	C	P
Initial weight (g)	732 ± 66	723 ± 90
Final weight (g)	2 558 ± 277	2 702 ± 236
Weight gain (g)	1 826 ± 257	1 979 ± 264
Feed consumption (g)	6 273 ± 717	7 164 ± 675*
Intake of water (l)	11.51 ± 1.56	14.02 ± 1.35*
Feed conversion (g/g)	3.44 ± 0.24	3.62 ± 0.42
Digestibility of nutrients (%)		
Dry matter	69.3 ± 3.5	67.6 ± 3.1
Crude protein	69.6 ± 6.2	69.0 ± 4.8
Crude fibre	19.4 ± 8.7	23.7 ± 6.2
NDF	31.2 ± 7.6	27.8 ± 6.2
ADF	27.4 ± 7.9	25.3 ± 7.3
Hemicellulose (NDF–ADF)	38.4 ± 3.4	32.8 ± 3.1*
Starch	90.8 ± 3.8	93.4 ± 3.1
Pectin	82.3 ± 4.5	71.1 ± 8.3*
Fat	90.7 ± 3.1	86.5 ± 3.1
Ash	55.4 ± 8.7	52.9 ± 5.9

* $P < 0.05$

III. Slaughter measurements and quality of meat in rabbits fed control (C) and sugar-beet containing diet (P); means ± SD

Slaughter variables	Diet	
	C	P
Slaughter weight (g)	2 633 ± 360	2 666 ± 301
Carcass weight (g)	1 427 ± 152	1 465 ± 170
Dressing percentage	54.3 ± 2.1	55.0 ± 1.4
Hindquarter (g)	713 ± 66	752 ± 87
Loin (g)	298 ± 38	308 ± 45
Hindlegs (g)	415 ± 31	444 ± 45
Perirenal fat (g)	41 ± 14	29 ± 17
Skin (g)	449 ± 90	472 ± 66
Meat quality parameters		
Dry matter (g/kg)	273 ± 14.2	273 ± 14.2
Protein (g/kg)	210 ± 5.5	212 ± 9.7
Fat (g/kg)	50 ± 14.5	45 ± 16.9
Cholesterol (g/kg)	0.94 ± 0.14	0.89 ± 0.10
Hydroxyproline (g/kg)	1.67 ± 0.14	1.61 ± 0.31
Gross energy (MJ/kg)	5.39 ± 0.52	5.26 ± 0.55

without decreasing the growth performance and quality of the rabbit meat. Although the levels of protein and pectin were different in diets P and C, the cholesterol content in rabbit meat was practically the same in both groups. Data on digestibility of hemicellulose and pectin in rabbits are rather scarce. Relatively high digestibility of hemicellulose (57.9%) has been reported by Sakaguchi et al. (1992). Lower digestibilities of hemicellulose have been reported by Gidenne et al. (1991a) and Gidenne, Perez (1993): 10.7–25.4% and 10.6–39.0%, respectively. Our findings (32.8 and 38.4%) are intermediate to these. Pectin is a valuable component of rabbit feeds. Gidenne et al. (1991b) found that pectic substances were highly digestible (70%), whatever the diet. Our data (71.1 and 82.3%) are in accordance with the mentioned results.

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Vliv zařazení vyloužených cukrovarských řízků do krmné dávky králíků na užitkovost, stravitelnost živin a kvalitu masa.

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Obilné šroty a vojtěškovou moučku lze v krmných směsích pro králíky zčásti nahradit vylouženými cukrovarskými řízky. V našem pokusu bylo 11 králíků krmeno dávkou s 20% podílem cukrovarských řízků a 11 králíků dávkou kontrolní se stejným obsahem vlákniny a stravitelné energie. U skupiny s cukrovarskými řízky jsme zjistili nesignifikantně vyšší hmotnostní přírůstky a signifikantně vyšší příjem krmiva a vody. Stravitelnost hemicelulózy se v průměru pohybovala mezi 32,8 a 38,4 %, stravitelnost pektinu mezi 71,1 a 82,3 %. U dávky s cukrovarskými řízky byla stravitelnost těchto komponentů signifikantně nižší. Stravitelnost ostatních složek dávky nebyla významně ovlivněna. Rovněž nebyl významně ovlivněn výtěžek masa, obsah cholesterolu v mase, ani další parametry jeho kvality.

králíci; vyloužené cukrovarské řízky

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