

DIGESTIBILITY OF NUTRIENTS IN HYBRID PIGS

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Three series of classic balancing experiments were carried out with 6 pig four-bred hybrids of the meat type. Investigation were performed under generally accepted methods in the 14th, 17th and 22nd week of their age that corresponds to average life weight of 40.37 kg, 65.17 kg and 91.08 kg at the growth intensity in the balancing periods 880 g, 980 g and 910 g daily and feed conversion corresponding the value of 2.06 kg, 2.56 kg and 3.08 kg mixtures/kg of gain. The expected levels of digestibility of fat, NFEM and ash were repeatedly confirmed with complete feed mixtures. A higher – approximately by about 10% than expected digestibility of fibres was recorded, and on the contrary, a lower digestibility (approximately about 10–15%) of nitrogenous substances. The coefficients of true digestibility CP were about 4% higher than the coefficients of balancing digestibility. Average values of the digestibility of energy of feed mixtures oscillated around 84%. There was pronounced a hypothesis of the necessity and repeated assessment of exactness of the prediction ME in mixtures for pigs of the meat type and the validity of the equation of the calculation of the need of ME for growing fattening pigs.

pig; balancing experiment; digestibility; utility of CP; energy

INTRODUCTION

The nutritive value of optional feed is usually limited by a whole spectrum of feeding and breeding influences, which generally determine the utilization of the animal from the given diet. It represents a utilization value limited by feed, its preparation and the technique of feeding, biological factors connected with the animal and the conditions of breeding (K o d e š , 2000).

The whole content of basic nutrients determined by chemical analysis has a little declaration value for the evaluation of the productive influence of feed. A pig does not have for the metabolism a whole range of accepted nutrients at disposal, but only the part, which was decomposed and resorbed (K o d e š et al., 2001).

The digestibility of the single nutrients is described by the coefficients of digestibility, expressing a percentual relation between the nutrients accepted by the animal and nutrients which not secreted from its body by faeces. This basic evaluation of the quality of feed, especially with nitrogen (respectively $N \times 6.25$) has usually a certain error, which is or is not taken into account. Faeces contain not only undigested residue of nutrients of dietary origin, but also metabolic N, which comes from digestive juices, intestinal epithelia's etc. Concerning this part, the secreted nutrients are corrected, the so-called real digestibility is stated. In the opposite case the result is only the seemingly, the so-called balancing digestibility (H e g e r , F r y d r y c h , 1981).

To state the digestibility, except of commonly used methods in vivo, there are a lot of laboratory methods in vitro. The digestibility of feed can be found out from feeding tables and databases for quick orientation. In this case there are generally used only coefficients of balancing digestibility (K a c e r o v s k ý et al., 1990).

The presented information is a part of the complex research of the dynamics of the changes of the body composition and slaughter value with growing, fattening pigs of the meat type. Attention was paid to the response of modern genotype of pigs, namely, the digestibility of basic nutrients and energy on the given unusually concentrated diet concerning nutrition (Table 1).

MATERIAL AND METHODS

The described experiment was carried out simultaneously with a feeding experiment and continually carried out controlled slaughters and analyses of the whole body of the slaughtered animals. The classic balancing experiment with application of the principle analogues (half siblings, the same age, weight, sex and state of health) included 6 four-breed hybrids (BU x L) x (D x Pn), dewormed pigs 12 weeks of age and an average body weight of 29.63 kg. Balancing followings were carried out according to the method of H e g e r and F r y d r y c h (1981) in the 14th, 17th and 22nd week of age, i.e. approximately in the end of the single phases of fattening, which corresponds to fattening to an average life weight of followings of 40.37 kg, 65.17 kg and 91.08 kg. Presenting feed according to the voracity of animals, taking of faeces, urine, its conservation, storage and following analyses were carried out according to the method of K a c e r o v s k ý et al. (1990).

Statistical evaluation and analyses of data were carried out by the use of Stratgraphic programme. Balancing followings were in accordance with accepted rules, fully respecting the laws and public notice concerning animal protection of animals from ill-usage.

Table 1. Component and nutrition composition of feed mixtures for different phases of fattening

Component in %	Fattening period		
	1st	2nd	3rd
Barley	36.6	39.3	42.8
Wheat	25.0	25.5	30.0
Maize	10.0	10.0	10.0
Soybean oil meal (43)	25.0	22.5	14.5
MVK-1	3.4	–	–
MVK-2	–	2.7	2.7
Total	100.0	100.0	100.0
Content of nutrients in g.kg ⁻¹ of mixture			
Dry matter	884.0	895.9	891.3
N x 6.25	196.0	187.5	161.1
Lysine	12.2	10.4	8.4
Fat	19.1	19.9	20.4
Crude fibre	37.5	37.8	35.1
NFEM	577.3	599.2	625.8
Ash	54.1	51.5	48.9
Organic matter	829.9	844.4	842.4
Brutto energy MJ.kg ⁻¹	16.24	16.45	16.25

RESULTS AND DISCUSSION

The quality of animal products in this case – carcass is defined by a wide spectrum of different criteria. In this context, reaching the highest qualitative parameters of animal production presupposes a very exact harmonization of genetic potential of animals and conditions of the outer environment (Anonym, 1999).

Nutritive factors influence the quality of meat and fat in different life periods of the animal with different intensity. The success of integration of the genotype and phenotypes with fed animals shows firstly with three sizes of body growth and feed conversion, which is in close link with the quality of the carcass and effecting the production of pork meat (Kodeš et al., 2001).

The values of potential utilization represent a determined limit by genotype, which cannot be overcome by the highest quality of nutrition. The most important indicator of potential utilization is the course of protein retention in the body from birth to the end of fattening. The calculation of other parameters follow from these values, characterizing the composition of the body, such as the growth of lean musculature, storing of fat, rate growth of water, mineral substances and also the calculation of the need of nutrients.

The data about some commercial genotypes concerning the storing of proteins during growth are abroad, for genotypes bred in the Czech Republic this information is not available. Papers of this character (Čiháková-Dřimalová, 1999; Zeman, 1999 and others) have lately been developed into a wide range not only in our country but in the whole world. Object of interest are particularities of protein and energy nutrition, potential

possibilities of utilization of the different breeds, lines and hybrids, the level of influence of new technologies or the dynamic of creation of utilization on the amino acid structure and processing characteristics, of productivity, efficiency, health and welfare of animals, the minimal impact of pork meat production on the environment etc.

The presented data (Table 2) show good conditions of the experiment and newly stated facts. On the first place attention is paid to the size or volume of daily feed intake, which were complete feed mixtures (Table 1) dry-matter at level 890 g.kg⁻¹. In this case can be submitted a great correspondence and exact of prediction of feed intake for growing, fattening pigs according to the age, according to the equation for meat type pigs, which are shown by Šimeček et al. (1995).

It is the fact that experimental animals were very good bred and in the framework of the experiment bred in appropriate zoo-hygienic and microclimatic conditions, they were in a good state of health and sufficiently watered. The relation of the given fodder and water oscillated around the value 1 : 2, with the age of animals the need of water intake relatively decreased. A similar tendency was noticed at the production of faeces.

The response of animals was counted by growth intensity, it was higher than expected. It is probably connected with: 1 – the concentration of nutrients in experimental diets, 2 – with the ability make up the meat of the carcass. A non-negligible input for a higher daily intake was probably a lower maintenance need, which can be explained by ideal external conditions, including minimal stress and limited movement in cages. With the same causes it is possible to explain a very positive fa-

Table 2. Dynamics of the digestibility of basic nutrients and energy with growing fattening pigs of the meat type (average values)

Indicator	Fattening period		
	1st	2nd	3rd
	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$
Sex	male	male	male
Number of animals	4	6	6
Life weight (kg)	40.37 ± 0.894	65.17 ± 0.783	91.08 ± 0.767
W ^{0.75}	16.02	22.94	29.49
Daily gain (g)	880 ± 49.9	980 ± 28.8	910 ± 21.2
Feed intake (kg)	1.81	2.50	2.80
Conversion of feed (kg)	2.06 ± 0.111	2.56 ± 0.079	3.08 ± 0.068
Water intake (l)	4.10	5.00	5.50
Production of faeces (kg)	1.42 ± 0.075	1.61 ± 0.061	1.92 ± 0.070
Coefficients of balancing digestibility			
Dry matter	82.06 ± 1.214	80.60 ± 1.253	82.30 ± 0.836
Fat	62.85 ± 6.024	62.00 ± 3.878	63.16 ± 4.091
Crude fibre	42.65 ± 3.023	39.36 ± 3.672	43.88 ± 2.381
NFEM	92.15 ± 1.372	91.79 ± 0.897	92.01 ± 0.749
Ash	23.47 ± 2.096	24.81 ± 0.904	25.55 ± 1.032
Organic matters	85.88 ± 1.223	84.75 ± 0.795	85.49 ± 0.836
N x 6.25	78.03 ± 1.648	73.77 ± 1.702	72.56 ± 1.887
Energy	84.40 ± 1.172	83.03 ± 0.750	83.77 ± 0.897
Coefficient of true digestibility			
Nitrogen	80.85 ± 1.681	77.05 ± 1.647	76.18 ± 2.088

avourable conversion of feed. A similar opinion is also presented by Šimeček and Zeman (1998). They show it in accordance with our findings that the production of meat, determined by the stored proteins in the body is a basic phenomenon, which decides not only growth intensity, conversion of fodder and slaughter value, but especially the economy of the whole pig breeding.

We came to different conclusions when studying the dynamics of digestibility of the decisive nutrients of the described kinds of feed. A certain stability was repeatedly confirmed and the level of digestibility of fat and NFEM of complete mixtures during the pig fattening. This approximately corresponds to weight average of the table coefficients of digestibility of the single mixture components.

The difference and a remarkable one (approximately 10 percentual points) was noticed at the digestibility of fibre, which probably is connected with a component composition of mixtures. Essentially, more important are on the contrary to table values, expressively lower (about 10–15 percentual points) the digestibility of crude proteins on the level of ileal digestibility of the first limiting amino acids), which influence not only the amount of the disposable amino-acids for the organism but also energy. Moreover, there is a decreasing trend visible and these are balance coefficients and also real digestibility of nitrogenous matters. This fact can be at least partly ex-

plained by an increasing ability of puffration of the diets (a high N concentration) and a decrease of the amount of filled in synthetic amino-acids into the experimental feed. The true digestibility of CP was about 4% higher than the balancing digestibility.

A lower than expected digestibility of organic nutrients of the tested mixtures is a logic consequence of the given facts. The digestibility of dry matter is marked by low coefficients of digestibility of mineral substances. Average values of digestibility energy oscillated around the value of 84% with a slight decreasing tendency.

During the fattening of modern hybrids pigs was detection digestibility of nutrients and energy from feeding mixtures of typical components for the Czech Republic. It was stated that the coefficients of balancing digestibility of nutrients were: fat around level 63%, NFEM about 92% and ash 25%. These values are conventional and we expected it. What we did not expect were higher values digestibility of crude fibre, or lower digestibility of crude protein, resp., which decrease with age of animals.

At the synthesis of the stated facts we come to the conclusion that it will be necessary repeatedly to assess:

- accuracy of the prediction of the balancing metabolism energy of complete feed mixtures for pigs of the meat (and obviously of the super meat) genotype,
- the validity of the equation of the calculation of the need of ME for growing pigs of the meat and super meat genotype.

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Stravitelnost živin u hybridních prasat.

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Byly zorganizovány tři série klasických bilančních pokusů na šesti vepřících, čtyřplemenných hybridních (BU x L) x (D x Pn) masného užitkového typu. Sledování proběhla podle všeobecně platných metodik ve 14., 17. a 22. týdnu věku prasat, což odpovídalo průměrné živé hmotnosti 40,37 kg, 65,17 kg a 91,08 kg, při intenzitě růstu v bilančních obdobích 880 g, 980 g a 910 g denně a konverzi krmiv odpovídající hodnotám 2,06 kg, 2,56 kg a 3,08 kg. Byla opětovně potvrzena očekávaná úroveň stravitelnosti tuku, BNLV a popelovin u kompletních krmných směsí. Byla zaznamenána vyšší (zhruba o absolutních 10 %) než očekávaná stravitelnost vlákniny a opačně nižší stravitelnost (zhruba o absolutních 10–15 %) dusíkatých látek. Koeficienty skutečné stravitelnosti NL byly o 4 % vyšší než koeficienty bilanční stravitelnosti. Průměrné hodnoty stravitelnosti energie výkrmových směsí kolísaly kolem hodnoty 84 %. Byla vyslovena domněnka o potřebnosti opětovného posouzení přesnosti predikce MEP ve směsích pro prasata masného typu a platnosti rovnice výpočtu potřeby MEP pro rostoucí vykrmovaná prasata.

prase; bilanční pokus; stravitelnost; živiny; energie

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