Quantitative and qualitative characteristics of meat of pigs fed with protein-carbohydrate feed

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Introduction

The solution of ecological problems when slaughtering and dressing the carcasses is largely determined by rational use of wastes. Therefore, in recent time much attention is given to the development of new technologies providing complex use of inedible wastes of animal origin. These wastes are primarily the content of rumens of cattle and keratin-containing raw materials. The first one is large in amount, its yield is about 10% of the live weight. It has little amount of proteins, but rich in cellulose and vitamins of group B. Keratin-containing raw materials are characterized with high content of protein with a full set of indispensable aminoacids, presence of large spectrum of microelements. However, due to specific molecular structure these raw materials are not digested by enzymes of gastro-intestinal tract of animals and birds and for decomposition of their molecular structure severe conditions of treatment are required. The existing technologies don't allow to obtain biologically valuable feed from the content of rumens, because the cellulose is practically not degraded which makes it inaccessible for enzyme system of animals with one chamber stomach and of birds. Taking this in to account the All-Russian Meat Research Institute has developed a technology of complex treatment of the content of rumens of cattle and keratin-containing raw materials which provides the enrichment of the final product with valuable protein and provides for modification of cellulose with partial formation of reducing sugars. The obtained protein-carbohydrate feed is characterized with the indices as follows, %: moisture – 10, protein – 32-35, mineral salts – 18-19, fat – 6-8, cellulose – 22-24, reducing sugars – 2-3. Taking into account a new technological solution, which allowed to obtain a qualitatively new feed it was interesting to study its influence on yield and characteristics of pork.

Objective

The objective of the work – to determine the effect of protein-carbohydrate feed on qualitative and quantitative characteristies of pig meat as compared to pork obtained from pigs obtaining traditional feeds.

Methods

The experiments were carried out on four groups of replacement gilts at the age of 130 days, n=15 in each group. The animals were selected according to live weight, age, breed. Compound feeds according to requirements were developed for each group of gilts. The compound feed of the control group of animals contained 5% of meat-bone meal. Compound feed of the first experimental group contained the same components as in the control group, but instead of 2,5 % of meal there were 3,0 % of protein-carbohydrate, in the compound feed for the second experimental group 1,7 % meat bone meal and 4,0 % protein-carbohydrate feed were used together with other similar components. In the compound feed for the third experimental group there were no meat-bone meal at all, and instead of it 6,1% of protein-carbohydrate feed was included. The energy value of compound feeds for all the groups, as well as the content of cellulose were similar in all the groups. The quantity of macroelements met the requirements, the correlation between calcium and phosphorus was as required and the level of microelements was balanced due to the incorporation of premix. Compound feeds were fed to the animals in wet condition (moisture content 60-65%). The length of growing was 145 days. After the end of feeding the pigs were slaughtered and the quantity and quality of the obtained pig meat was evaluated.

Results and discussion

The change of live weight of replacement gilts in all the groups is presented in Table 1.

The daily increase of the live weight in the groups in % as related to the control was: control group – 100; experimental I – 100,7 %; experimental II – 97,3%, experimental III – 96,5%. And the amount of compound feed consumed per 1 kg of live weight gain (kg) between the groups was as follows: control – 4,5; experimental I – 4,47; experimental II – 4,63; experimental III – 4,67, that is as related to the control group, in % are respectively: 100; 99,3; 102,8 and 103,8.

From Table 1 it can be seen that at 66% and 100% replacement of meat-bone meal by compound feed the daily weight gains of the replacement gilts decreased insignificantly, by 2,7 and 3,5 %, respectively as related to the control. And the compound feeds consumption in the first experimental group were by 0,7% lower, and in the second and third experimental groups, by 2,8 and 3,8% higher than in the control one.

Table 1

Average gain of live weight of replacement gilts during raising

Age of animals, days	Groups							
	Control		Experimental I		Experimental II		Experimental III	
	Live weight, kg	Daily gain, g	Live weight, kg	Daily gain, g	Live weight, kg	Daily gain, g	Live weight, kg	Daily gain, g
130-135	39,5-49,5	460	39,2-49,0	392	38,9-48,9	400	38,9-48,8	396
156-185	49,5-64,4	497	49,0-64,0	500	48,9-64,3	513	48,8-64,6	527
186-215	64,4-80,0	520	64,0-79,7	523	64,3-79,3	500	64,6-76,4	393
216-245	80,0-96,4	547	79,7-95,1	513	79,3-93,5	473	76,4-92,3	530
246-275	96,4-114,8	613	95,1-115,1	666	93,5-112,1	620	92,3-111,5	640
130-275	**39,5-114,8**	**519**	**39,2-115,1**	**523**	**38,9-112,1**	**505**	**38,9-111,5**	**501**

Results of control slaughter of replacement gilts reaching puberty having 100 and 120 kg of live weight are presented in Table 2.

Table 2.

Yield and quality characteristics of meat of replacement gilts with the weight 100 and 120 kg of different groups

Characteristics	Groups of animals							
	Control		Experimental I		Experimental II		Experimental III	
	100 kg	120 kg	100 kg	120 kg	100 kg	120 kg	100 kg	120 kg
Carcass weight, kg	61,9	81,6	61,8	81,4	62,1	82,9	61,7	82,6
Carcass yield, % of live weight	61,9	68,0	61,8	67,8	62,1	69,1	61,7	68,8
Length of carcass, cm	93,0	97,0	92,7	96,7	93,7	96,7	94,0	98,0
Fat thickness, cm on withers	3,6	4,2	3,6	4,1	3,6	4,2	3,6	4,1
at 6-7 thoracic vertebrae	3,1	3,6	3,1	3,6	3,1	3,6	3,0	3,5
under the 1st lumbar vertebrae	2,9	3,3	2,9	3,3	2,9	3,4	2,8	3,2
on sacrum	3,2	3,7	3,3	3,7	3,3	3,7	3,1	3,6
On the average	3,3	3,7	3,3	3,7	3,3	3,7	3,1	3,6
Eye area, cm^2	30,0	32,9	30,5	33,4	30,3	33,2	30,2	33,1
Weight of ham without skin, kg	9,5	11,3	9,5	11,3	9,7	11,5	9,7	11,8
including: meat	5,7	6,7	5,7	6,7	5,9	6,9	5,9	7,0
back fat	2,8	3,5	2,8	3,5	2,8	3,5	2,8	3,6
bones	1,0	1,1	1,0	1,1	1,0	1,1	1,0	1,2
Distribution of meat, back fat and bones in ham, %:								
meat	60,3	59,2	60,2	59,1	60,8	59,7	60,8	59,6
back fat	29,2	30,8	29,5	31,2	28,8	30,5	28,8	30,5
bones	10,5	10,0	10,3	9,7	10,4	9,8	10,4	9,9
Back fat content per 1 kg of meat	491	522	491	522	474	507	474	514
Relation of meat to back fat	2,03 / 1	1,91 / 1	2,03 / 1	1,91 / 1	2,11 / 1	1,97 / 1	2,11 / 1	1,94 / 1

The data obtained show that the eye area, thickness of back fat, weight of ham, ratio of tissues in the ham of the gilts of all the groups independently on the contents of meat and bone meal in the diet or protein-carbohydrate diet were actually similar.

It should be noted that gilts of II and III groups which had a protein-carbohydrate diet instead of 66% and 100% of meat and bone meal, had the yield of back fat per 1 kg of meat by 3,5% and 1,5-2,9% less than in control animals having the weight 100 and 120 kg, respectively.

Conclusions

The developed protein-carbohydrate feed based on the contents of rumens of the cattle and keratin-containing raw materials is a valuable feed of animal origin and can be used in compound feeds for replacements gilts. It was found that the replacement of 50% of meat-bone meal by the developed protein-carbohydrate feed in the compound feed ensures almost identical productivity of growth of replacement pigs (average gain of live weight 523 g vs 519 g in the control). Increasing the share of the replacement meat-bone meal by 66% and 100% of protein-carbohydrate feed in compound feed leads to some decrease of average weight gains, but the value of this decrease is small – by 2,7% and 3,5% respectively.

Use of protein-carbohydrate feed in the diet of replacement gilts instead of a part or the whole amount of meat-bone meal in the diets did not lead to the decrease of the yield and qualitative characteristics of slaughter products of replacement gilts. It was found that use of protein-carbohydrate feed led to the increase of the share of muscle tissue instead of back fat in the ham.

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