Quality of the meat from the bulls fed additionally with pigs excrements

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The experimental group of bulls was fed with solid separated pig's excrements containing 40-50% of the dry weight for the period of eleven months in the dose of 10 kg per head per day. In the nutrition portion of the reference group of bulls the excrements were substituted with an increased amount of corn silage. The average net mass of the reference group was 527,9 kg and that of the experimental group 534,7 kg and all the animals were classified as being of "A" quality. No changes in the contents of the dry weight, ashes, fat and proteins were found in the meat of the bulls fed with the pig's excrements. The differences in pH values and ammonia content measured in the meat for the period of 1 to 196 hours after the slaughter were not significant. The content of hydroxyproline decreased by 37,6% ($P < 0,001$) with the reference group of bulls while the fat and vitamin A contents in the liver increased by 5,6% ($P < 0,01$) and 57,5% ($P < 0,001$), respectively. A shift of amino acids content in the meat occurred although it was not verified statistically by the T-test.

Eigenschaften des Fleisches von Bullen, denen Schweine-Exkremente zum Futter beigemischt wurden

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Der separierte feste Anteil von Schweine-Exkrementen mit 40-50% Trockensubstanz wurde 11 Monate lang in der Menge von 10 kg/Tier/Tag an eine Versuchsgruppe von Bullen vertfüttert. Bei der Kontrollgruppe wurden Exkremente durch erhöhte Ration von Maissilage ersetzt. Die durchschnittliche reine Körpermasse war 527,9 kg in der Kontrollgruppe und 534,7 kg in der Versuchsgruppe. Alle Tiere hatten die Qualitätsbewertung A. Im Fleisch der Bullen, die Zugabe von Schweine-Exkrementen erhalten hatten, wurden keine Veränderungen im Gehalt an Trockensubstanz, Asche, Fett und Eiweiss festgestellt. Die in 1 bis 196 Stunden nach dem Schlachten gemessenen pH und Ammoniak-Werte wiessen keine signifikanten Unterschiede aus. Zu beobachten war bei der Versuchsgruppe ein verringerter Spiegel von Hydroxyprolin (um 37,6% - $P < 0,001$), ein erhöhter von Fett in der Leber (um 5,6% - $P < 0,01$) und von Vitamin A in der Leber (um 57,5% - $P < 0,001$). Eine Verschiebung des Aminosäurengehalts im Fleich konnte festgestellt, jedoch durch den T-Test nicht statistische nachgewiesen werden.

I.4

Qualités de la viande des taureaux après alimentation supplémentaire par excréments de porc

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Pendant 11 mois, l´alimentation d´une groupe des taureaux était supplémentée par 10 kg/ /animal/jour de la fraction solide separée des excréments de porc, contenant 40-50% de la substance sèche. Chez la groupe comparée, les excréments étaient remplacées par quantité additionelle dénsilage de mais. En moyenne, le poids pure était 527,9 kg dans la groupe expérimentelle et 537,7 kg dans la groupe de controle. Tous les animaux furent qualifiés en classe A. Dans la viande des animaux déxpériment, le contenu en matière sèche, cendre, grasse et albumines nétait pas changé. Les différences en values de pH et ammoniac, mesurées 1 - 196 heures suivant abatage, étaient insignificantes. Chez la group expérimentelle, le taux de la hydroxyproline était diminué par 37,6% ($P<0,001$), celui de la grasse en foie elévé par 5,6% ($P<0,01$) ainssi que celui de la vitamine A en foie par 57,5% ($P<0,001$). Un glissement du contenu en acides aminés fut observé, mais ne pouvait pas entre confirmé par évaluation statistique.

Свойства мяса быков кормленных с добавлением искражнения свиней

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Подопытная группа быков была кормлена жесткой сепарированной частьей искражнения свиней о содержании с 40 до 50 % сухово вещества в течение 11 месяцев в порции 10 кг/лицо/день. В порции корми контролной группы быков были искражнения заменены большим количеством кукурузного силоса. Средная чистая материя была у контрольной группы 527,7 кг, у подопытной группы 534,7 кг и все отдельные лица были включены в качественный класс А. В мясе быков кормленных искражнением свиней не изменилось содержание сухово вещества, зола, жира и белка. Разница стоимости водородного показателя и аммиака измеренная в течение с 1 до 196 часов после убоя не была доказательная. Содержание оксипролина пониэилось у подопытной группы о 37,6% /П<0,001/ и далее у этой группы повысилось содержание жира в печени о 5,6 %/П<0.01/ и содержание витамина А в печени о 57,5 %/П<0,001/. Далее поменьше изменилось содержание отдельных аминокислот в мясе. Эти изменения не показались доказательными Т- тестом.

I.4

Nutritional Value of the Meat of Bulls Fed on Pig Excrement Solids

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Introduction and Review of the Literature

Czechoslovak agriculture is to increase its gross product by 13%, with a view to meeting the demand for quality raw materials of animal origin from domestic sources. Of particular importance is the increased production of meat, an indispensible part of the human diet. This requires the introduction of new feeding technology and the use of high-yielding breeds of domestic animal. Along with the increase in quantity the quality of all types of meat must also be improved.

It must be borne continuously on mind that in increasing production by means of modern feeding technology the biological value of the foodstuffs which are produced must be maintained. According to Dobeš /1967/ a biologically valuable foodstuff is one with the optimal composition and properties both quantitively and qualitatively required to ensure the development of all biological functions of an organism without either acute or chronic negative changes. This definition implies that in order to obtain high quality foodstuffs it is essential to know what intravital factors are capable of influencing its biological value during its formation in the live animal, with especial regard to the effects on the individual nutritional components of the food. These factors include, apart from diseases of an infectious nature /MIKULÍK 1976, JANÍČEK 1977/, the influence of new feeding mixtures, which cannot so far be reliably said to have no effect on the foodstuff in the process of its formation /DOBEŠ et al. 1975/.

Only limited reference is made to these factors in the available literature, which deals only with the offects of various feedstuff additives on the chemical composition of meat. For example, DOBEŠ et al. /1975/ refer to a decrease in the content of dry matter, fat, manganese and vitamin A in the liver when broilers are fed on urine products. WAHLSTROM et al. /1971/ found a decrease in oleic acid and an increase in linoleic acid in pigs whose feed was supplemented with boiled soya beans. The fat component showed itself to be highly variable, usually undergoing the greatest qualitative changes also, which is indicated by the works of MOLNÁR and ABEL /1972/ and DINIUS et al. /1974/.

In view of the above-mentioned facts we undertook to determine the basic nutritional factors of the biological value of the meat of bulls /dry matter, ash, fat in the meat, proteins, hydroxyproline, fat in the liver and vitamin A in the liver/ which had had pig excrement added to their feed, and to compare them with the nutritional factors of the meat of bulls fed by traditional methods. The supplementing of feedstuffs with excrement has recently been tested in various field and semi-field experiments, as this technique is advantageous from an economic point of view/VRCHLABSKÝ 1977/.

Material and Methods

Experiments began in 1977 on two groups of bulls, a control and an experimental one, each containing 16 animals. Part of the maize silage in the feed of the experimental group was replaced by pig excrement solids.

After reaching the required weight the bulls were slaughtered and subjected to veterinary examination. Within 30 min. of slaughter samples of meat /m. longissimus dorsi/, suprarhenal fat and liver were taken for analysis. The actual laboratory investigation was begun 24 h after slaughter in all cases.

The amounts of dry matter, ash, fat, total nitrogen and calculated from these, the content of proteins in general, hydroxyproline and the amino acid spectrum were calculated. Fat and vitamin A were determined in the liver.

The amount of dry matter was determined using the method at a temperature of 105° C. For a period of 48 h. Ash content was determined by combustion at a temperature 550°C. for a period of 48 h. Fat was extracted from the muscle tissue using a chloroform-methanol /2 : 1/ mexture for 12 h on a Soxhlet extractor. Total N was measured using the method of JOSLYN /1970/ in a Markham distillation apparatus and, using the ammonia values obtained, the total N and protein /factor 6.20/ was calculated. The method of ARNETH and HAMM /1971/ was used to determine hydroxyproline content, based on the reaction of oxydation product with p-dimethylaminobenzaldehyde, and the resulting chromatic reaction was measured photometrically at a wavelenght of 550 nm.

Fat in the liver was measured by the same method as that in the meat, vitamin A using the method described by SVOBODA /1974/.

For the determination of the individual amino acids on an 881 automatic amino

acid analyser acid hydrolysate was used. The measurements themselves were carried out using a modification of the method of NAPRAVNIK /1976/.

Results and Discussion

The mean values arising from the laboratory investigation are set out in Tab.1. It can be seen from the table that the amount of dry matter, ash and fat was the same in both groups. Protein, calculated drom total N, with a value of 21.39 g/100 g for the control and 21.86 g/100 g for the experimental group, indicates a negligible increase in the case of the experimental group, but is not statistically significantly increased. Statistically significant increases were observed in hydroxyproline and fat and vitamin A in the liver. Hydroxyproline mean values in the experimental group were 64 mg/100 g lower /$P < 0.001$/. On the other hand fat and vitamin A in the liver increased, in the case of fat to a level of significance of $P < 0.01$ and in the case of vitamin A to a level of significance of $P < 0.001$.

The increase in fat in the liver may be caused by metabolic changes of a negative character.

In view of the fact that hydroxyproline is an indirect indicator of the proportion of second-class connective tissue in the meat /KLEIN 1962, PROST et al. 1963, DVORÁK 1977/, its decrease in the experimental group of bulls can be regarded favourably. The same applies to the evalution of the increase of vitamin A in the liver.

Tab.2 sets out the mean content of amino acids in the meat of the two groups of bulls. It can be seen from the table that the amino acid content in the two groups of bulls was so similar that there is no statistically significant difference. There is a slight increase in threonine and methionine in the experimental group, and the remaining essential amino acids i.e. lyzine, valine, izoleucine, leucine and phenylalanine show a slight fall in the experimental group. As far as the nonessential amino acids are concerned, a statistically significant fall in mean values was observed for arginine, serine and proline and a slight increase in aspartic acid.

It follows from the amino acid values and their changes that the quantitive relations in the amino acid spectrum change only negligibly in the meat of bulls fed on a pig excrement supplement. The statistically quite insignificant changes in amino acids are also in line with the statistical insignificance of changes in the protein content of the beef. The decrease in proline, which according to MUSIL et al. /1976/ is a precursor of hydroxyproline, is in accord with the decrease in the latter as described above. Similar changes in the content of individual amino acids were found by GRUHN et al. /1977/ in the meat /m.longissimus dorsi/ of bulls fed with pig excrement.

Conclusion

A study was made of the basic chemical composition of the meat of bulls fed with solids derived from pig excrement. It was found that there was no change in the content of dry matter, ash and fat in the meat of the bulls compared with a control group. The total protein content rose by 2.2%, the content of hydroxyproline fell by 37.6%, the vitamin A content in the liver rose by 57.6% and fat in the liver by 6.6%. Slight changes were revealed in the content of individual amino acids.

Table 1

Basic chemical analysis of beef

Substance	Unit	n	group control	group experimental
dry matter	g/100 g	16	25,42	25,63
ash	g/100 g	16	1,12	1,13
fat in meat	g/100 g	16	9,20	9,35
total N	g/100 g	16	3,42	3,50
proteins	g/100 g	16	21,39	21,86
hydroxyproline	mg/100 g	16	170,16	105,16^{+++}
fat in liver	g/100 g	16	9,50	10,03^{++}
vitamin A in liver	m.j./g	16	245,92	387,41^{+++}

$P < 0,05^{+}$ $P < 0,01^{++}$ $P < 0,001^{+++}$

Table 2

Amino acid content of beef in g/100 g dry matter

Amino acid	group	
	control	experimental
Essential		
Lysine	6,582	6,491
Threonine	3,469	3,504
Valine	3,228	2,971
Methionine	2,004	2,045
Izoleucine	2,868	2,793
Leucine	5,668	5,584
Phenylalanine	2,664	2,555
Others		
Histidine	3,275	3,292
Arginine	5,145	3,629
Asparic acid	7,075	7,297
Serine	3,014	2,758
Glutamic acid	11,821	11,449
Proline	3,480	3,249
Glycine	3,568	3,352
Alanine	4,606	4,506
Thyrozine	2,859	2,804