Technological proprieties of meat mechanically separated from cooked bones

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Bones processing and meat derivation takes place on the specially designed technological line. Appliced technology includes following unitary processes: cooking row fresh bones in water, crushing, separation of meat from crushed bones with specially designed worm press, drying and grinding of waste bones. As the final products are obtained: meat, grease, fodder flour and concentrated bouillon from process of cooking bones, which can be used for production of food concentrates. Organoleptic, microbiological and fisical-chemical proprieties of deboned meat which average ratio to raw material /raw fresh bones/ yields 25% were tested. In chemical analysis of deboned meat content of collagen, Ca, Fe, Pb, Sn, viscosity and water absorption ability were tested. 38% of fat, 15,8% of protein incl. 4,8% of collagen and Ca in quantities lesser than 1% were found in deboned meat during analysis. Viscosity and water absorption ability indicates decreased functional proprieties of that meat in emulsions. Further tests proved that addition of 10% mechanically deboned meat to sausages and tinned meat products and addition of 25% to meat pie doesn't affect quality of these products. Conducted microbiological test confirmed earlier suppositions about high microbiological purity of that meat.

Die technologische Eignung von Fleisch, das mechanisch von gekochten Knochen abgetrennt wurde.

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Die Verarbeitung von Knochen und darin die Fleischgewinnung erfolgt auf einem speziellen Produktionsband. Der Prozess besteht darin, dass die Knochen in Wasser gekocht und dann zerkleinert werden, das Fleisch wird auf einer Schneckenpresse abgetrennt und der Knochenrückstand wird getrocknet und zerkleinert. Folgende Produkte werden erhalten: Fleisch, Fett, Futtermehl und ein konzentrierter Absud aus den gekochten Knochen für die Produktion von Lebensmittelkonzentraten. Das Fleisch /durchschnittlich 25 % im Verhältnis zu den Rohknochen/ wurde physikalisch-chemischen, sensorischen und mikrobiologischen Untersuchungen unterzogen. Es wurden die chemische Grundzusammensetzung, der Kollagengehalt, der Gehalt an Ca, Fe, Pb, Sn, die Viskosität und die Wasseraufnahmefähigkeit bestimmt. Man hat festgestellt, dass dieses Fleisch durch einen hohen Fettgehalt Ø 38 % charakterisiert ist, Eiweissgehalt 15,8 % darin 4,8 % Kollagen. Der Ca-Gehalt überschritt nicht 1 %. Die bestimmte Viskosität und Wasseraufnahmefähigkeit weisen auf herabgesetzte funktionelle Eigenschaften dieses Fleisches in Füllungen hin. Anwendungsversuche mit diesem Fleisch bei Fleischprodukten haben gezeigt, dass ein Zusatz bis zu 10 % zu Wurstwaren und Konserven und bis zu 25 % zu Pasteten die Qualität dieser Produkte nicht verändert. Die mikrobiologischen Untersuchungen haben die Vermutungen über die grosse mikrobiologische Reinheit dieses Fleisches bestätigt.

II.6

Les propriétés technologiques de la viande séparant mécaniquement des os cuits

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La préparation des os et surtout le débit de la viande se déroulent sur une ligne technologique spéciale. C'est le principe de la méthode que les os sont cruits dans l'eau, puis découpés et ainsi que la viande est séparé des os dans une presse à filer, le reste des os sont séchés et émiettés. On recoit des produits suivants: viande, saindoux, farine à fourrage et une décoction concentrée provenant des os cuits et qu'il peut être employée dans les produits concentrés de l'industrie alimentaire. La viande /en moyenne 25 % de la partie des os crus/ a été soumis aux méthodes physico - chimique, aux examination sensorielle et microbiologique. Il a été déterminé la composition chimique, la teneur en collagène, en Ca, Fe, Pb, Sn, la viscosité et le pouvoir d'absorption de l'eau. On a constaté que la teneur en saindoux de la viande est 38 %, la teneur en protéine 15,8 %, dont en collagène est 4,8 %. La teneur en Ca ne dépasse pas la valeur de 1 %. La viscosité et le pouvoir d'absorption de l'eau montrent lespropriétés fonctionnelles réduites de la viande, en état emulsionné. Les expériences au but d'être employée cette viande dans la fabrication des produits de la viande, elles ont prouvés que l'addition de la viande aux produits de saucissons et des conserves jusqu' au 10 % et aux pâtés jusqu'au 25 % ne fait pas changer la qualité de ces produits.
Les examinations microbioloqiques ont démontré la supposition de la grande propreté microbioloqique de cette viande.

Технологическая оценка мяса механически отделенного от вареных костей.

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Переработка костей , а при этом получение мяса, проводится на специальной линии. Процесс заключается в варении костей в воде, их измельчении, отделении мяса от костей на шнековом прессе а также в сушении и раздроблении костного выхода из пресса. Получается мясо, жир, кормовую муку и сгущенный отвар из варки костей, который применается в производстве пищевых концентратов. Мясо, которого получается в среднем 25% (по отношении к сырым костям), подвергнуто физико-химической, органолептической и микробиологической оценке. Определено его элементарный состав, содержание коллагена, некоторых металлов:Ca,Fe,Pb,Sn а также вязкость и водопоглощаемость. Проведены эксперименты доказали, что это мясо отличается большим содержанием жира, в среднем 38%, белка I5,8%, в том числе коллаген 4,8%. Количество кальция не было выше I%-та. Определённая вязкость и водопоглощаемость указывают, что отделенное мясо от костей отличается снижением функциональных показателей в мясных фаршах.
Многочисленные органолептические оценки колбасных изделий и консервов, вырабатываемых с добавлением до I0% мясной массы полученной из костей к колбасам и популярным консервам а до 25% к паштетам доказали, что качество готовых изделий не снижается и находится в рамках нормативно-технических требований. Микробиологические исследования мяса, полученного из вареных костей доказали, что мясо такое отличается хорошими микробиологическими показателями.

11.6

Technological properieties of meat mechanically separated from cooked bones

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Introduction

Growing tendency to improve economical efficiency of meat processing enterprises and necessity to increase the production of meat protein couses that proper bones utilisation becames recently an object of peculiar interest. It brings about an expansive growth of meat deboning systems.

Among different products from bones the most economical and nutritional value exhibits the meat obtained in meat deboning process. Performed studies show, that depending on quality, race, and grade of livestock, it is possible to obtain 5 - 14% of meat during accurately conducted manual cutting out the meat from bones. Proper utilisation of that meat becomes an important subject of consideration in every larger meat processing enterprise.

Bones, including marrow, make 9 - 18% gross weight of dressed carcass. Mechanical systems of separation meat from fresh bones applicating high pressure procedure are recently the best known and developed ones. Mechanical seperation of meat from cooked bones is much less popular because of wide spread opinion that such a meat has less technological value and is more difficult in further processing.

Cooked bones processing technology including equipment and machines has been worked out recently in Meat and Fat Research Institute and Food Machines Institute in Warsaw. Designed technological line with total output of 10 - 15 tons of cooked bones per 24 hours is fully mechanised.

Determination of chemical and technological properties of the mechanically separated meat from cooked bones has constituted the main part in designing the line.

Material and Methods

Bones were cooked for 2 hours at the temp. of 90 - 95°C. Cooked bones were grinded to 16 mm. The meat was then separated being pressed by perforations of 0,8 mm. Pork and beef bones in relation 2:1 were processed. Temperature of the meat after processing was 50-70°C. The meat after separation of fat was used for chemical and technological analysis.

For comparison purposes the meat recovered from row bones in Seffelar Looyen.

Chemical and mikrobiological analysis were performed by conventione methods.

Determination of mineral was performed with spectrophotometer of atomic absorption /Jarral Ash type/.

Meat products recipes were worked out on the basis of organoleptic tests in 5 points scale and consumer analysis.

Viscosity tests were performed with the use of rotary viscosimeter typ Rheotest 2 in 10000 - 18000 dyn as/cm^2 shifting tensions range.

Weight losses during cooking process were estimated by Walczak method measuring. Losses of weight of 20 g meat sample heated in water bath for 10 min in temp. of 85°C.

Water holding capacity was measured with centrifugal method. Minced meat samples of 4 g mixed with water were left for 1 hour. Then water was separated on centrifuge with 7000 rot/min during 30 min. Free water was poured off. Water holding capacity was expressed as quantity of water bound by 10 g meat sammple.

Results and discussion

Soft tiussues from manually separated cooked bones yielded 12,5-28,0% in the case of pork

bones and 7 - 18,5% in the case of beef bones. Lower values concerned shoulder bones and higher ones - back bones. An average of 24 - 30% of meat was obtained in our pressure separation process. The higher yield of meat with application of the designed system took place because of marrow pressed out from internal bone tissues.

The chemical composition of mechanically deboned meat differed considerably from the fresh one /table 1 and 2/. The fat content increased and protein content decreased giving the dry substance quantity bigger in the case of meat mechanically deboned - much bigger in comparison with the meat manually separated from cooked bones. Changes in collagen content proportions were also significant.

Losses of meat juices from bones during cooking process resulted in higher content of dry substance in cooked meat. Fat and collagen contents increased as they were components being easier separated from hot bones in the hot press /Table 2/.

Deboned meat was characterised by a grey-brown colour typical for cooked meat. Its stability was however limited because of oxidation.

Examinations of minerals content proved that the amounts of Fe, Zn, Sn, Pb and Ca found in the meat were far below the accepted Levels. Ca content didn't exceed 1%, Fe content was 28 ppm, Zn content - 16,4 ppm. Pb and Sn weren't practically found in 2 grams of meat.

Deboned cooked meat had a very limited water holding capacity because of high content of denatured proteins. However at the same time, it produced smaller losses during the thermic process when used in sausage production /table 3/.

Performed meat viscosity tests showed that its viscosity was in the order of normal finely comminuted meat for sausage production. It amounted in average to 135-3350 poises.

Table 1

Chemical composition of manually separated meat from cooked bones

Raw material	Dry matter %	Ether extract %	Protein %	Ash %	Ca %	Collagen	
						total %	in protein %
Pork bones	32,9-50,9 44,0	15,1-30,1 22,6	17,2-23,8 20,6	0,4-1,1 0,8	0,02-0,06 0,05	5,8-10,3 7,3	22,6-52,4 35,6
Cattle bones	31,3-40,2 35,8	16,1-19,4 17,2	14,9-20,1 18,1	0,5-0,9 0,7	0,02-0,06 0,04	5,8-10,1 8,8	39,4-55,0 48,6

Table 2

Chemical composition of mechanically separated meat from raw and cooked beef and pork bones

Raw material	Dry matter %	Ether extriact %	Protein %	Ash %	Ca %	Collagen	
						total %	in protein %
Pork and beef in proportion 2 : 1	34,6-54,7 50,3	23,7-41,7 34,7	8,9-16,9 14,1	1,2-3,2 1,5	0,2-0,5 0,3	1,4-2,6 1,9	8,6-18,1 13,4
Pork and beef cooked bones in proportion 2 : 1	52,1-64,8 55,6	23,1-39,7 32,8	15,2-19,7 17,6	3,8-6,1 4,9	0,5-1,0 0,9	4,1-6,3 5,1	20,6-32,8 30,0

Table 3

	Deboned meat		Meat stuffings with addition of debonned meat			
	cooked	raw	cooked		raw	
			10%	20%	10%	20%
Water holding capacity g water per 10 g of meat	1,42	2,03	-	-	-	-
Weight losses during thermic process %	17,5	23,5	24,5	25,8	26,0	27,2

The application of raw, mechanically deboned meat in meat processing required special care from producer because of high bacterial contamination unlike, the mechanically separated meat from cooked bones distinguished itself by high microbiological purity. Total count of bacteria in 1 g of meat amounted 50000 - 200000; coliform bacteria - none in 0,1 g; coagulase - positive staphylococcous - strains - none in 0,1 g; anaerobic sporeforming bacillus strains - none in 0,1 g.

In organoleptic tests it was found that the meat from cooked bones can be used in the quantities of 5 - 25% in meat-products made of fine minced meat and canned meat products such as meat pies and other. In a given assortment of product its colour grows grey and its consistency grows slack when maximal addition of deboned meat was exceeded; its taste and flavour was also changed. Usually greater quantities of spices were added to the products an purpose to improve their taste.

Summary

Meat separated from cooked bones can be used as a component of different meat products. However, addition of that meat is limited because of its characteristic taste and technological properities and should not exeed 10% in sausages and 25% in meat pies.

Microbiological contamination of such a meat is very low.