Influence of freezing and chilled state storage on the technological properties of minced meat.

M. LALOV, S. DANCHEV

Higher institute of the food industry, Plovdiv, Bulgaria.

Tests were carried out to determine the influence of freezing and storage at - 10° , -20°, -30°C upon structural-mechanic properties of minced meats.

For that purpose were used minced meats prepared from chilled weal and pork: weal 100%; veal 40% - pork 60%, pork 100%.

It was established that freezing and storage at - 20°, -30°C for 60-70 days did not influence considerably the structural-mechanic properties of the tested products.

DER EINFLUSS DES GEFRIERENS UND DER LAGERUNG IM GEFRORENEN ZUSTANDAUF DIE TECH-NOLOGISCHEN EIGENSCHAFTEN VON GEHACKTESFLEISCH

M. LALOV, S. DANTCHEV

HOCHSCHULE FÜR NAHRUNGS - UND GENUSSMITTELINDUSTRIE

PLOVDIV VR BULGARIEN

Es wurden Versuche durchgeführt zur Feststellung des Einflusses des Gefrierens und der Lagerung bei -10°, -20°, -30°C auf die strukturmechanischen Eigenschaften von Gehacktesfleisch.

Zu diesem Ziel wurde Gehacktesfleisch von gekühltem Rind-und Schweinefleisch ver-wendet: 100% Rindfleisch, 40% Rindfleisch und 60% Schweinefleisch und 100% Schweine-

Es wurde festgestellt, dass das Gefrieren und die Kühllagerang bei -20⁰ und -30⁰C in einer Zeitdauer von 60-70 Tgaen nur einen sehr unwesentlichen Einfluss auf die strukturmechanischen Eigenschaften der untersuchten Produkte ausübte.

INFLUENCE DE LA CONGELATION ET DU STOCKAGE SUR LES PROPRIETES TECHNOLOGIQUES DE LA VIANDE HACHÉE

M. LALOV, S. DANCHEV

Institut Supérieur des Industries Alimentaires

Plovdiv Bulgarie

Ce travail a pour but l'étude de l'influence de la congélation et du stockage à une température de -10° , -20° et -30° sur les propriétés structurales et mécaniques de la viande hachée.

L'essai a porté sur une viande hachée préparée de la viande de veau et de porc réfrigérée: viande de veau 100%; viande de veau 40% et viande de porc 60%; viande de porc 100%.

On a constaté qu'une congélation et stockage à une température de -20° et -30°C pour une durée de 60-70 jours ne change pas considérablement les propriétés structurales et mécaniques du produit examiné.

Влияние замораживания и последующего хранения на технологические свойства фарша.

М.ЛАЛОВ и Ст.ДАНЧЕВ

Высший Институт пищевой и вкусовой промышленности, г.Пловдив. ПР Болгария.

Проведены исследования по установлению элияния замораживания и последующего хранения при -IO⁰, -20⁰ и .-30⁰C на структурно-механические свойства фарша.

Для этой цели использованы фарши, приготовленные из охлажденной телятины и свинины: телятина - 100%; свинина - 100% и телятина 40% со свининой 60%. Установлено, что замораживание и следующие сохранение при -20°С и -30°С в течение 60-70 суток не оказывает существенного влияния на структурно - механические свойства исследованных продуктов. Influence of Freezing and Storage in Frozen State on the Technological Properties of Minced Meat

I. Changes of the Structural and Mechanical Properties

MONI LALOV and STEFAN DANCHEV

Higher Institute of Food and Flavour Industries, Plovdiv, Bulgaria

Introduction

Minced meat is a ready-to-cook food widespread in the public catering and retail trade which is better and better received by the mass consumers. Previously prepared minced meat facilitates to a great extent cooking a relatively large variety of dishes at home. The existing normative regulations for trading with minced meat in chilled state only, render difficult the realization of the said product. An expansion of the possibilities of trade with minced meat could be achieved by freezing and storage in frozen state. In this respect, however, neither the normative papers nor the theory provide definite instructions. Furthermore, without any experimentally supported theoretical statements available it is the custom to think that freezing and storage in frozen state is undesirable and inadmissible. And while the problems related to the production, the characteristics, the cold treatment and storage of minced meat of various kinds of fish are considerably widely covered by the literature, the studies dealing with minced meat of slaughter animals are relatively more rarely found. These studies mainly treat problems of sanitary and hygienic character. A relatively limited number of papers discusses partial questions of cold treatment of minced meat of slaughter animals and studies concerning the influence of freezing and storage in frozen state on the technological properties of minced meat are almost unavailable. The above provided a basis for carrying out the present studies. Material and Methods

For the purpose, minced meat taken from the current industrial production of the meat packing houses, of three varieties - 100% minced veal, 40% minced pork and 60% minced veal, and 100% minced pork, was used.

One part of the material was put at +4°C and preserved for 10 days. Studies were carried out in the moment of production on the 2nd, 4th, 7th and 10th day since the beginning of the storage. Another part of the samples was immediately frozen up to -10°, -20° and -30°C and left for preservation at the relevant temperatures. Studies were achieved after freezing on the 10th, 30th, 60th and 90th day since the beginning of the storage in frozen state. The present paper show the results obtained from studies carried out to establish the influence of the freezing and storage in frozen state on the structural and mechanical properties of various kinds of minced meat.

Minced meat is a complex dispersed system having protein substances, water and lipids as main components. According to the classification of Rebinder, by its structure and rheological properties minced meat is assigned to the group of the coagulation tixotropic bodies which are marked by a relatively slight adhesive force between the particles. Depending on the quantitative ratio of the main components as well as on their colloid and physical condition, minced meat proves to be either a solid or a liquid. These peculiarities of minced meat leave their mark on the procedures which are to be used for establishing its structural and mechanical properties. For the purpose, methods which have to be dependent on

7.2

the colloid state of the protein substances and their ability of linking available water are to be applied. In this instance, the following methods: tenderness after Grau and structural solidity proved to be most suitable. The experimental results obtained and processed by the methods of the mathematical statistics are given in the form of graphs. <u>Experimental Results</u>

The data in Fig. 1 show that the tenderness of various kinds of minced meat changed similarly during the storage at +2° to +4°C. It is characteristic that these changes can be divided into two stages:

a) First stage - with durability till the 4th day in all cases. In this instance, a lowering of the tenderness was observed to the 2nd-4th day and then the tenderness was restored in all the cases except for minced veal to the initial one or slightly over it. b) Second stage which started from the 4th day and continued till the end of the storage characteristic of a slow increase of the tenderness in all the cases. In the said respect the same character was shown by the data for the structural solidity (Fig. 2) - the initial structural solidity and that after the fourth day was higher than that for minced veal and lowest for the minced pork. Two stages of the changes were also observed for the said index: intensive changes during the first one - in the beginning the values of the index decreased with minced veal and increased with minced pork so that till the 2nd day the values of the index for the three kinds of minued meat almost fell in line and then again moved apart till the 4th day. After this period the values obtained maintained at one level till the 7th day and gradually began to decrease till the 10th day. In general, the dependence of the changes on the storage durability of various kinds of minced meat was identical for the two indices characteristic of the structural and mechanical changes - tenderness after Grau and structural solidity.

The experimental results given in Fig. 4 show that regardless of the freezing temperature the freezing process itself was accompanied by an authentic decrease of the structural solidity of minced veal. At the subsequent storage of minced meat in frozen state it is characteristic that irrespective of the temperature, till about the 30th day some accelerated increase of the structural solidity was observed which exceeded the initial one at -10° and -20°C and reached the initial ones at -30°C. The subsequent storage at -10°C was accompanied by a gradual increase of the structural solidity while at -20° and -30°C it can be assumed that some retention of the structural solidity reached till the 30th day occurred which lasted till the 60th day and then followed by a quick increase of the latter till the 90 day while the final values exceeded these obtained at -10°C. In case of the second index - tenderness after Grau - the freezing process itself exerted no influence on the values determined as the deviations obtained were within the confidence interval (Fig. 3). Then, however, some lowering of the tenderness occurred at the three temperatures which was most marked at -10°C and equivalent at the other two temperatures. In the case of the preceding index as well as in this instance, the subsequent storage was accompanied by an improvement of the tenderness at -20° and -30°C while till the 30th day of storage it reached the initial values and maintained at this level till the 60th day and then it began again to show a slow lowering till the end of storage. At the same time, in this instance too, the changes of the index at -10°C differred from these obtained at the other temperatures i.e. after the lowering of the tenderness occurred till the 15th day the values maintained at this level and just after the 30th day began to increase in order to reach the initial quantities by the 60th day of storage.

The experimental results obtained for the structural solidity of minced pork during its freezing and storage at -10°, -20° and -30°C are given in Fig. 6. The data show that

the freezing process itself, regardless of the temperature, was accompanied by some authentic increase of the structural solidity which was within 25-30% of the initial value. The subsequent storage of minced pork in frozen state was accompanied by some decrease followed by an increase of the structural solidity. In general, it could be assumed that till about the 50th day since the beginning of the storage the values of the structural solidity maintained about the level reached after the freezing and then they authentically increased till the end of the storage.

In the case of the index of tenderness after Grau (Fig. 5), the freezing process itself exerted a slight influence while the storage till the 15th-30th day was accompanied by some improvement by 20% of the tenderness at -20° and -30°C. The storage after the 30th day, in all cases, was accompanied by a lowering of the tenderness while the values were reduced by some 20-22% under the initial ones.

The experimental results obtained for the changes of the structural and mechanical properties during the freezing and storage of mixed minced meat (40% veal and 60% pork) are given in Fig. 8 (structural solidity) and in Fig. 7 (tenderness after Grau). These data show that in all cases the freezing process was accompanied by lowering of the structural and mechanical properties (by some 20% of the initial values of the indices). In the case of the structural solidity it could be then assumed that a gradual increase of the values of the index occurred by the end of the storage up to -30° C followed by a more accelerated increase of the said ones till the 60th day at -10° and -20° C and then some decrease appeared at these temperatures. After an initial lowering of the tenderness during freezing, at the subsequent storage of frozen mixed minced meat at -10° C a slow worsening of the latter gradually occurred till the end of 15-30 days some restoration of the tenderness occurred without reaching the initial values while after that it maintained practically at one level till the end of the storage.

1

1

0

In conclusion, from the point of view of the structural and mechanical properties it should be assumed that:

1. The temperatures (-10°, -20° and -30°C) used for freezing and cold storage evert an identical influence on the structural and mechanical properties of mixed minced meat.

2. The freezing process itself as well as the subsequent storage of minced meat in frozen state exert an influence on the structural and mechanical properties of minced meat. However, the stated changes are marked by a deviation from the initial values of the order of 15-30%.

Therefore, taking into consideration the character and the quantity of the deviations from the values of the indices characteristic of the structural and mechanical properties of mixed minced meat in comparison with their initial values it can be assumed that its freezing and storage in frozen state is quite admissible in the course of 90 days.

