

Study of Sausage Products Heating Rate During Thermal Treatment Under Pressure

S. N. TUMENOV, K. M. BEGALIN, Z. B. KAZIEV

Semipalatinsk Technological Institute of Meat and Milk Industry, Glinka Street 49, USSR

SUMMARY: During thermal treatment of sausage products there occurs moisture transfer from centre to periphery which restricts the process of heating rate spreading to the centre of a sausage. It was supposed that heating rate was higher due to high moisture binding ability of sausage stuffing in sausages.

Investigation has shown that pressure on sausage stuffing influences heating rate. The maximum rate was observed under the pressure of 0.1×10^5 Pa. It was recommended to stabilize density of stuffing in sausages by pressure control during molding.

INTRODUCTION: Methods of investigating thermophysical characteristics of meat products don't take into account density change of a studied sample and presence of external mass exchange. During molding of sausage products the density of sausage stuffing in a casing is an alternating quantity and depends, in particular, on a casing material tightness.

During thermal treatment diffusion process (moisture transfer) conditioned by concentration difference prevails over heat-moisture conductivity conditioned by temperature gradient. As a result of this, moisture transfers from centre to surface. Moisture counter transfer restricts the process of heat spreading to the centre of a sausage. It may be assumed that heating rate is higher in those sausages the stuffing of which has a higher moisture binding ability and moisture exudation of which is accordingly lower.

MATERIALS and METHODS: The influence of pressure upon sausage stuffing in artificial protein casing and upon the change of heating rate during thermal treatment of cooked sausage products was investigated. To determine heating rate conditions corresponding to the thermal regime of regular regime (of the first kind). During investigation a casing filled with sausage stuffing was attached to a cylinder with a piston. The piston produced the required quantity of pressure upon stuffing in the casing. A temperature indicator was led into the centre of stuffing sample through the hollow rod of the piston. The casing with stuffing was immersed into a thermostat with water temperature of 90°C . Readings of temperature indicators in the centre of the sample and those of water in the thermostat were recorded by a recorder. Heating rate was determined by the difference of temperature in the centre of the stuffing sample and that of water according to G. M. Kondratjev's methods.

RESULTS and DISCUSSION: Heating rate changes under various pressures upon sausage stuffing. Heating rate has a maximum value under the pressure corresponding to optimum moisture binding ability of stuffing and the pressure quantity is 0.1×10^5 Pa (Table 1).

Table 1.

Influence of pressure and temperature on heating

Pressure upon sausage stuffing - 10 ⁵ Pa	Heating rate	
	in the range up to 48 ^o -53 ^o C	in the range from 48 ^o -53 ^o to 68 ^o C
0	9	13.7
0.1	10.8	15.4
0.2	9.7	13.8
0.3	8.8	12.1
0.4	8.3	11.5
0.5	8.0	12.2

This proves the unity of mechanisms of heat- and mass-exchange occurring during thermal treatment of sausage products. This is also proved by the fact that moisture exudation rate increases to the moment of reaching the temperature of 48^o-53^oC in the centre of stuffing sample and then it is stabilized. Heating rate in the period of thermal treatment when moisture exudation is stabilized is also of great importance.

CONCLUSIONS: While molding of sausage products it's necessary to stabilize stuffing density in sausages by the control of pressure under which sausage stuffing is stuffed into a casing.

It's necessary to take into account density, i.e. pressure upon the studied sample and presence of external mass-exchange while determining thermophysical characteristics of meat products.