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ЕВРОПЕЙСКИЙ КОНГРЕСС РАБОТНИКОВ
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RESEARCH ON HAM CURING AND MANUFACTURE

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RESEARCH ON HAM CURING AND MANUFACTURE.

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The aims of the given research were as follows: to cut ham production time, to use chilling and curing areas better, to improve sanitary conditions, to reduce losses during ham production, and besides, to find out whether it is possible to pass over from traditional to continuous line production.

At present, the following ham production technology is widely spread:

fresh side - chilling - dressing, boning and removing tendons - - ham pumping through the circulatory system or intramuscularly curing - draining - drying or smoking - molding - placing ham into molds - cooking - chilling - packing - shipping for sale.

After having carried out the investigations, this technology scheme has been changed:

fresh meat dressing - fresh ham and picnic boning - brine injection by means of a multineedle unit, simultaneous chilling and curing in pickle, containing nitrite - wrapping ham into a

film - placing ham into molds - cooking - chilling - shipping for sale.

In this paper we intend to touch upon certain of numerous problems of ham production technology, namely, raw ham curing and wrapping into films; due to some reasons, it is desirable to change these stages of ham production.

The works of our Institite workers (1-3, 6-10, 13-15), our home experience and literature abroad contain many data concerning the solution of a number of ham curing technology problems. Deeper studies of salt penetration process and of diffusive and osmotic metabolic processes from the practical points of view gave interesting results. Most significant are the investigations of salt penetration speed, i.e. curing time reduction. With this aim in view some investigators increased the temperature of pumping pickles; they reported the acceleration of salt penetration and colour development. The Soviet research workers L.Lavrova, N.Kravchenko, T.Polrtayev, A.Bolshakov and A.A.Sokolov tried to get good results using accelerated curing by hot pickle. Others loosened meat tissue structure by means of high-frequency currents or ultrasound. A.Zinoviev, A.Bolshakov, N.Ogulnik and G.Tinyakov tried to solve this problem, using vibration method. Well-known is the work of our Institute workers on the use of vacuum.

Conventional curing methods mentioned above are complicated and rather expensive. In mass production they require complicated installations, and nevertheless do not give satisfactory results.

Below we describe more simplified, uniform, requiring little

time, and hence more economical technology, providing a higher quality product from the point of view of hygiene.

To accelerate curing, the initial raw material is pre-boned. The fact is that decrease of meat depth, by itself, promotes more rapid salt penetration. Instead of one needle pumping through the circulatory system, there is used intramuscular pumping with the brine (having 16° Bé strength) by means of a multineedle unit.

Boned ham and picnics are laid closely to each other on the perforated stainless steel trays, which are then moved up to the multineedle unit. The needles are sticked into the product by a moving arm (the unit cintains 60 needles of 2mm in diameter and 120 mm in length each; the distance between the needles is 25 mm).

While slowly removing the needles, the brine solution is forced into the product under the pressure of 5 kg/cm^2 by the regulating valve. The brine makes 10-12% of the meat weight.

To improve sanitary condition of the finished product, it is wrapped into cellophane film and cooked. The film is smooth, transparent, air- and water-tight; it protects the product up to the moment of consumption.

Our preliminary experiments on multineedle pumping with chilling in the pickle and cooking in film are perspective. Chemical analyses showed that $NaNO_2$ and NaCl levels were adequate. Organoleptic evaluations of ready products gave good results, their colour, flavour and consistency being better than those of products manufactured by the conventional method. The

traces of needles on the muscle tissue surface were imperceptible. Thus, we managed to significantly cut the prolonged conventional technological process (10-11 days from slaughter)

Comparative investigations of old and new technologies were repeated ten times, comparable conditions from the point of view of technology and the initial raw material being provided. Pig carcass was cut into sides (longitudinally). The ham and picnic of the one side were processed by the conventional method and those of the other side - by the new method.

Jelly formation under the cellophane film was not practically observed. Average weight losses of the ham and picnic cooked in films were 2.5% less compared to the products manufactured without films (see Table 1). It is seen from the Table that during individual experiments dispersion of losses while cooking is significant ($S = 1.94$) due to the heterogeneity of the initial raw material.

During commercial production, if 95% guarantee is assumed, the following formula can be applied:

$$D = T \cdot S \cdot \frac{1}{n},$$

where

D - the average value of the results	2.51
T - 95% guarantee factor	1.83
S - calculated dispersion	1.94
n - the number of measurements	10

Table 1

Weight losses during ham and picnic cooking.

Type and No of tests	Cooking losses (in %)		Difference
	by conventional method	in films	
1. Semi-commercial test	21.08	20.34	0.74
2. - " -	26.96	23.39	3.57
3. - " -	22.49	21.08	1.41
4. - " -	30.31	28.91	1.40
5. - " -	33.62	28.43	5.19
1. Commercial test	25.32	19.13	6.19
2. - " -	23.72	22.99	0.73
3. - " -	23.51	21.72	1.79
4. - " -	28.02	25.58	2.44
5. - " -	26.80	26.04	0.76
Total	26.14	23.63	2.51

From the table data it is seen that, when the new technology is applied, the difference of cooking losses makes 2.5 $\pm$ 1.14%.

If ham is produced in cellophane film, trimming losses are eliminated which constitute about 1.5%, according to our calculation, of the product weight.

Five series of analyses (24 comparative analyses all in all) were made to determine microbial contamination of ready product surface. The analyses were made after 24 and 72 hour

storage to find out the total nimber of microorganisms and anaerobes.

The results are given in Table 2.

Table 2

Changes in microorganisms number during storage of ham produced by the conventional and new (in films) methods.

Analyses series	Storage time to analysis	Total number of microorganisms		Anaerobes number	
		in film	without film	in film	without film
I.	6 hrs	$9.3\ 10^7$	$1.5\ 10^2$		
		$9.3\ 10^7$	$9.3\ 10^3$		
		$4.3\ 10^7$	$7.5\ 10^7$		
		neg. 10^7	$4.3\ 10^4$		
		neg. 10^7	$7.5\ 10^3$		
II	6 hrs	$4.3\ 10^7$	$2.3\ 10^2$		
		$2.3\ 10^7$	$2.3\ 10^3$		
		neg. 10^7	$9.3\ 10^2$		
		neg. 10^7	$4.3\ 10^7$		
III	30 hrs	$9.3\ 10^7$	$9.3\ 10^7$	10^7	10^4
		$1.2\ 10^3$	$1.5\ 10^7$	10^2	10^6
		$9.3\ 10^2$	$7.5\ 10^7$	10^3	10^5
		$2.3\ 10^7$	$2.1\ 10^8$	10^2	10^6
IV	3 days	$1.5\ 10^5$	$4.3\ 10^6$	10^2	10^6
		$2.3\ 10^2$	$4.3\ 10^6$	10^4	10^6
		$2.3\ 10^4$	$4.3\ 10^5$	10^5	10^6
		$4.3\ 10^4$	$9.3\ 10^7$	10^5	10^6
		$2.3\ 10^3$	$9.3\ 10^7$	10^5	10^6
V	3 days	$9.3\ 10^3$	$9.3\ 10^6$		
		$4.3\ 10^3$	$4.3\ 10^5$		
		$7.5\ 10^2$	$7.5\ 10^6$		
		$4.3\ 10^4$	$9.3\ 10^6$		
		$9.3\ 10^2$	$2.1\ 10^7$		

In the batches, investigated, the total number of micro-organisms and the number of anaerobes were regularly significantly less.

We intended to use the research on ham production, carried out in our Institute, at a big plant with continuous line production method.

L.Körmöndi, E.Szarka and K.Inch took part in these investigations.

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