Use of starter cultures in the production of raw-dried non-comminuted pork products II. Influence of starter cultures upon the hydrophilic properties of raw-dried non comminuted pork products

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Introduction

In order to shorten the technological cycle in the production of raw-dried non-comminuted meat products use has been made of starter cultures by including them as a component of the cures (I,5,6). Starter cultures not only speed up the production process but they exert a definite effect upon the technological properties of products too.

To find out the effect that starter cultures have upon the technological properties of meat products during the process of their production as well as upon the finished product, it is necessary to follow the changes that occur in both their structural mechanical and hydro - philic properties.

The aim of the present work was to study the effect of the starter cultures of Pediococcus sp. upon the hydrophilic properties of raw-dried non-comminuted pork products.

Materials and Methods

The studies were conducted to determine the changes in the hydrophilic properties caused by the starter cultures of Pediococcus sp. Two types of raw-dried non-comminuted pork products - "Plovdiv" and "Trakiya" - were tested in accordance with a scheme described in detail in our previous paper (Report I).

Evaluation of the hydrophilic properties was made by determining the following indices:free water after Grau (3), waterholding capacity by centrifugation (8) and water-absorption capa-

city (7). The water content and the pH of the test and control samples were simultaneously determined in compliance with standard methods (4).

The experimental data were processed by method of mathematical statistics (2) and are presented in tables as confidence interval $\bar{x} \pm tm$, where: $\bar{x}$ - is the mean value from n=33 measurements, m - mean square error, t - coefficient of Student for the accepted by us 95 % confidence interval.

Resultas and Discussion

In Table I are presented the data on the changes in the amount of free water after Grau.

Table I

Amount of free water after Grau mg/H_2O/g meat

Moment of study \ Type of product	"Plovdiv"		"Trakiya"	
	test	control	test	control
1	2	3	4	5
Initial raw material	257,33±3,42	255,00±3,39	176,14±6.24	173,06±6,03
On 2nd day	194,19±5,08	167,00±4,10	143,23±5,41	128,52±3,33
On 6th day	114,00±3,24	95,3 ±4,71	84,22±4,45	68,45±5,02
On 8th day	52,49±2,67	47,25±3,05	51,55±3,32	43,27±3,95
On 16th day	29,62±2,00	25,73±3,53	39,79±4,02	30,50±2,72
On 22nd day	17,42±0,49	14,42±1,45	30,18±2,25	20,12±4,32

It is seen from Table I that the index values decrease con tinuously in both the test and the control samples of the two types of products. This decrease is more pronounced in the test samples. The results obtained for the changes in the amout of free water are in agreement with those obtained for the changes in the waterholding capacity and the water content

Table 2

"Plovdiv"		"Trakiya"	
st	control	test	control
	3	4	5
11	9,18±1,29	10,00±0,70	10,50±0,34
64	7,49±0,40	9,18±0,49	7,60±0,97
80	5,12±0,27	8,00±0,58	6,15±0,63
76	4,21±0,39	6,43±0,79	4,79±1,12
92	2,90±0,54	4,29±0,27	2,99±0,57
30	1,78±0,52	3,00±0,16	2,07±0,49

he water-holding capacity tands to decrease significantly in iv" and "Trakiya" products. A considerable dacrease in the ved during the drying process. Due to intensified dehydra- he water content of the tested samples also decreases.

Table 3

"Plovdiv"		"Trakiya"	
st	control	test	control
	3	4	5
,69	72,82±0,69	69,59±0,56	69,53±0,56
,81	73,71±0,53	71,58±0,66	73,62±0,28
,48	68,47±1,22	61,82±0,78	66,99±1,01
,06	66,55±0,59	56,54±0,89	61,04±1,42

1	2	3	4	5
On 16th day	54,48±1,10	59,68±1,02	46,69±0,93	57,21±0,75
On 22nd day	43,76±0,45	50,97±0,93	41,91±0,12	49,93±0,79

On 22nd day of processing the water content of the samples produced with the starter cultures amounts to 43,76 % for "Plovdiv" and 41,91 % for "Trakiya" thus meeting the standard requirements for a finished product (water content up to 45 %).

Table 4

Water-absorption capacity, %

Moment of study / Type of product	"Plovdiv"		"Trakiya"	
	test	control	test	control
1	2	3	4	5
Initial raw material	18,03±1,17	17,94±0,67	21,05±1,11	21,18±1,92
On 2nd day	11,28±1,04	14,50±0,90	12,20±1,78	16,13±0,99
On 6th day	8,34±0,67	10,62±0,52	8,03±0,31	12,00±1,72
On 8th day	5,12±0,48	8,58±1,20	4,54±0,90	9,60±0,74
On 16th day	4,31±0,42	7,06±0,92	3,61±1,01	7,70±1,21
On 22nd day	3,99±1,02	6,18±1,15	2,90±1,53	5,50±1,23

In Table 4 are given the data on the index of water-absorption capacity. The same tendency to a decrease in the index values is seen. The water-absorption capacity of the test samples of the two types of products has lower values compared with the control samples.

The hydrophilic properties of the tested samples are closely related to the changes in pH. The pH data in Table 5 show a tendency to a sharp decrease in the pH of the test samples after curing and at the beginning of the drying process while at the end of the technological process a certain increase can be seen. This tendency is typical for both the test and control samples of the two types of pork products.

Table 5

pH

Moment of study / Type of product	"Plovdiv" test	"Plovdiv" control	"Trakiya" test	"Trakiya" control
1	2	3	4	5
Initial raw material	6,18±0,03	6,20±0,02	6,42±0,03	6,40±0,04
On 2nd day	5,60±0,05	5,80±0,02	5,92±0,04	6,15±0,02
On 6th day	5,45±0,04	6,00±0,04	5,76±0,06	6,22±0,02
On 8th day	5,50±0,04	6,08±0,06	5,92±0,04	6,29±0,05
On 16th day	5,61±0,03	6,10±0,02	5,96±0,01	6,31±0,02
On 22nd day	5,74±0,02	6,17±0,05	6,11±0,02	6,36±0,04

The obtained results show that the starter cultures have a definite effect upon the hydrophilic properties of the investigated raw-dried non-comminuted or products. The higher decrease in free water, water-holding and water-absorption capacities and the pH changes in the test samples can be explained with certain rapid destructive changes that occur in the structure elements of the muscular tissue as well as with the rate of the diffusion transfer of water. It is known that at a decrease in pH to values close to the isoelectric point of meat products, i.e., about 5,4 the water-holding capacity significantly decreases(5). The same regularity is proved by our studies. The more rapid decrease in pH under the influence of the bacterial cultures applied to the test samples at the very beginning of the technological process causes a decrease in the water- holding capacity which results in not only a decrease in the ability of the structure net to hold the water, but to bind any added water. Certain variations and an increase observed in the pH particularly at the end of the technological process can be attached to the non-homogeneous structure of the tested meat products wich effects the growth of the bacterial cultures and probably to an accumulation of mainly

basic metabolic products from the hydrolysis of the amino acids.

In conclusion it can be said that the used starter cultures of Pediococcus sp. speed up the process of moisture removal and exert an essential influence upon the dynamics of changes occuring in the hyrophilic properties of raw-dried non-comminuted pork products, hence they offer an opportunity of shortening the technological process and manufacturing meat products of high quality and a long shelf-life.

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