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Changes in some B-complex vitamins contents during production of pasteurized canned ham, shoulder and loin

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INTRODUCTION

In recent years, modern intensive industrial methods of breeding and feeding slaughter animals are being applied ever so widely in many countries. This made a number of authors (4, 6, 11, 12, 16, 22, 25, 31) study the vitamin content of meat.

Some of them (16) establish vitamin content of individual muscle groups and anatomical parts of one and the same carcass, while others (1, 23, 25) study the vitamin contents of liver and some parenchymal organs. Along with this, the majority of authors (2, 3, 5, 7, 8, 9, 10, 11, 13, 14, 15, 17, 18, 19, 20, 21, 24, 26, 29, 30) report also data about the effect of individual technological processes in the processing, canning, and storage of meat, on its vitamin content.

STUDIES IN THIS LABORATORY

In conducting the present investigations, our aim was to:

1) determine in our conditions the content of the B-complex vitamins: thiamin, riboflavin, pyridoxin, inosite, biotin, and nicotinic acid in cooled pork, produced in the winter-spring season from pigs fed concentrated feed mixes, containing synthetic vitamins;
2) establish in the technology adopted in this country, the changes in the content of the said vitamins after curing and dripping of hams, shoulders and loins in their processing into pasteurized canned meats;
3) estimate pasteurinzation effect on the vitamin contents of canned hams, shoulders and loins.

MATERIALS AND METHOD

Studies were conducted from February till May, 1968, a season most

unfavourable in this country as far as the natural sources of vitamins in feeds are concerned.

By way of material we used cooled pork, produced from lots of pigs with live weight of 95—105 kg., consisting of Bulgarian White pigs and their crosses with Large White pigs. Pigs were fed concentrated feed mixes, containing premixes in whose composition vitamins of the B-complex were contained in the following quantities: thiamin up to 2384 mg, riboflavin up to 1298 mg, pyridoxin up to 1183 mg, and nicotinic acid up to 21246 mg, per 100 kg of feed mix. Doublet samples were taken from ham (m. quadriceps femoris), shoulder (m. praescapularis), and loin (m. longissimus dorsi) of cooled pork carcass. Experimental hams, shoulders and loins were cured in accordance with the technology adopted in this country, doublet samples being taken from the same muscles before their placing into cans to be sealed. After pasteurization of cans from the experimental packs samples were taken again for analysis.

All the samples taken after acid hydrolysis were analysed for the B-complex vitamins: thiamin, riboflavin, pyridoxin, inosite, biotin, and nicotinic acid, by use of the microbiological method, after E. N. Odintsova (27, 28). By way of indicative strains were used Zygosaccharomyces morxianus, Debaromyces disporus, Zygosaccharomyces bisporus, Saccharomyces carlsbergeusis, Saccharomyces Ludwigii K. M., Lactobacterium casei, on the synthetic mineral nutrient medium of V. Rider. For the quantitative determination of the vitamins, standard and operating rows were compiled for each of the six vitamins.

RESULTS AND DISCUSSION

1. *Vitamin contents of cooled hams, shoulders and loins*: Before sampling, the hams, shoulders and loins were cooled at 3—4° C for 18—24 hours. The results of these analyses are shown in Table 1.

Table 1. *Vitamin content of cooled pork hams, shoulders and loins within 24 hours after their production (mean values in mg per 100 g of product).*

B-complex vitamins	*Hams*	*Shoulders*	*Loins*
Thiamin	1,260	1,250	1,225
Riboflavin	0,200	0,220	0,210
Pyridoxin	0,350	0,350	0,300
Inosite	1,230	1,300	1,300
Biotin	0,068	0,060	0,070
Nicotinic acid	5,450	5,100	5,000

Data in the table show, that cooled hams, shoulders and loins are a good source of the vitamins of the B-complex, thiamin, riboflavin, pyridoxin, inosite, biotin, and nicotinic acid. The content of nicotinic acid, thiamin and inosite is highest, and that of biotin — the lowest. Mean values in mg per 100 g of meat from ham, shoulder, and loin, show insignificant differences. Hams appear to be higher in thiamin and nicotinic acid, and lower in riboflavin and inosite. Shoulders show higher riboflavin content and lower biotin content. In loins, slightly more biotin is found in comparison with hams and shoulders, but at the same time less thiamin, pyridoxin and nicotinic acid are contained. Equal quantities of pyridoxin are established in ham and shoulder, and of inosite in shoulder and loin. The results obtained in our study, coincide with the maximum quantities established for thiamin in pork, produced from pigs fed concentrated feeds (6). Compared to data reported by other authors (11), our results point to a considerably higher nicotinic acid content in 100 g of pork.

2. *Changes in B-complex vitamins in the processing of cooled hams, shoulders and loins after curing and pasteurization!* Cured hams, shoulders and loins were sampled after dripping, and pasteurized canned meats, after their cooling.

Data on the vitamin contents of hams after curing and pasteurization, are shown in Table 2.

Table 2. *Vitamin content of pork hams after cooling, curing, and pasteurization (mean values in mg per 100 g of product)*

B-complex vitamins	*Cooled hams*	*After curing*	*% losses against cooled hams*	*After pasteurization*	*% losses against cured hams*	*Total % losses*
Thiamin	1,260	1,180	6,4	1,150	2,4	8,8
Riboflavin	0,200	0,195	2,5	0,160	15,5	18,0
Pyridoxin	0,350	0,350	—	0,320	8,9	8,9
Inosite	1,230	0,730	40,6	0,950	+17,8	22,8
Biotin	0,068	0,060	11,8	0,050	14,6	26,4
Nicotinic acid	5,450	3,750	31,6	3,620	3,5	35,1

The results in the table point to a retention of pyridoxin during curing and dripping of hams, and at the same time the highest per cent losses in inosite and nicotinic acid are observed in them. During the pasteurization of hams, nicotinic acid is hardly subjected to changes at al, while the inosite

content increases. This increase was established in all the samples analysed, after pasteurization, but always in a quantity smaller than the inosite content of cooled meat. During curing, riboflavin and thiamin show insignificant changes, while during pasteurization thiamin and pyridoxin appear resistent, along with nicotinic acid. Besides, the smallest loss during both curing and pasteurization is displayed in thiamin (8,8 %) and pyridoxin (8,9 %), whereas the greatest loss is observed in nicotinic acid (35,1 %).

The changes in the vitamin content of cooled pork shoulders after their curing and pasteurization are shown in Table 3.

Table 3. *Vitamin content of pork shoulders after cooling, curing, and pasteurizatin (mean values in mg per 100 g of product)*

B-complex vitamins	*Cooled shoulders*	*After curing*	*% losses against cooled shoulders*	*After pasteurization*	*% losses against cured shoulders*	*Total % losses*
Thiamin	1,250	1,200	4,0	1,150	4,2	8,2
Riboflavin	0,220	0,210	4,6	0,150	27,3	31,9
Pyridoxin	0,350	0,350	—	0,300	14,3	14,3
Inosite	1,300	0,750	42,4	1,050	+39,4	13,0
Biotin	0,060	0,058	3,4	0,055	5,0	8,4
Nicotinic acid	5,100	4,000	21,5	3,300	13,7	35,3

In shoulder, pyridoxin also remains unchanged throughout the curing and dripping processes. During curing, losses in thiamin, riboflavin and biotin are insignificant. Here also the greatest losses during curing are displayed in inosite and nicotinic acid. During the pasteurization of shoulders, greater losses in riboflavin, pyridoxin, and nicotinic acid are established, as compared to the losses during the pasteurization of hams. Here also we observed an increase in inosite after pasteurization. Total loss of vitamins, due to curing and pasteurization, is smallest in thimin (8,2 %) and biotin (8,4 %), whereas nicotinic acid displays greatest losses (35,3 %).

The changes in the B-complex vitamin content of loins during curing and pasteurization, are demonstrated in Table 4.

It can be seen from the table, that beside pyridoxin that remains unchanged during curing of loins too, no losses are found in biotin either, during curing and dripping, as well as after pasteurization and cooling. The estimated values of the biotin content of pasteurized canned loins are equal to those obtained for cooled loin. Here also thiamin and riboflavin display insignificant losses during curing. The greatest losses during those techno-

Table 4. *Vitamin content of pork loins after cooling, curing, and pasteurization (mean values in mg per 100 g of product)*

B-complex vitamins	*Cooled loins*	*After curing*	*% losses against cooled loins*	*After pasteurization*	*% losses against cured loins*	*Total % losses*
Thiamin	1,225	1,200	2,1	1,050	12,5	14,6
Riboflavin	0,210	0,208	1,0	0,140	32,7	33,7
Pyridoxin	0,300	0,300	—	0,280	6,7	6,7
Inosite	1,300	0,680	47,7	1,000	+24,6	23,1
Biotin	0,070	0,070	—	0,070	—	—
Nicotinic acid	5,000	3,950	21,0	3,300	13,0	34,0

logical processes are found for inosite and nicotinic acid. Thiamin displays greater losses during pasteurization of loin, as compared to that in hams and shoulders, while losses in pyridoxin are smaller. Here also, an increase in inosite after pasteurization is established. Total loss of vitamins throughout the whole process of production of pasteurized loins, is smallest for pyridoxin (6,7 %), and greatest for nicotinic acid (34,0 %) and riboflavin (33,7 %).

CONCLUSIONS

1. Pork hams, shoulders and loin contain considerable amounts of B-complex vitamins, thiamin, riboflavin pyridoxin, inosite, biotin and nicotinic acid. Nicotinic acid, thiamin and inosite contents are the highest;

2. Insignificant differences are established in the contents of the B-complex vitamins under investigation, for the different cuts of pork carcass (ham, shoulder and loin);

3. Considerable losses in the inosite and nicotinic acid content are established during the curing of cooled hams, shoulders and loins. This makes it necessary to shorten the duration of the technological processes of curing and dripping;

4. During pasteurization, more significant changes are observed in the contents of riboflavin and pyridoxin, while changes in thiamin, nicotinic acid and biotin are insignificant. A quantitative increase of inosite is established in canned meats after pasteurization.

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