

Effect of PSE meat on processing properties of cooked sausage and ham

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Introduction

The use of PSE pork in the meat products industry does not provide any technical advantages and in fact causes problems (1, 3, 4). Use of PSE meat in the preparation of dry sausage produces a pale colour, weak fat emulsifying capacity, a granular, crumbly texture and poor consistency (3, 4). It also causes a high weight loss due to the fact that PSE meat dries c. 50 % faster than normal meat (3). In the preparation of cooked sausage, PSE meat causes a 5-10 % higher than normal weight loss (4), depending on the amount used (half or all PSE meat). In the preparation of cooked ham PSE meat causes a high cooking loss (3,8 % higher than normal), which results in a product that is dry, tastes sour and has a pale colour (4). Although PSE meat causes only small economic losses when used in raw cured products, it adversely affects quality: there are deviations in colour and flavour formation (4).

The purpose of this study was to investigate the effect of PSE meat in the preparation of cooked sausage and smoked ham.

Material and methods

The pH value (Knick 651 and Ingold 404 T electrode) of gluteus medius muscle from split carcasses was measured 45 minutes after stunning ( $pH_1$ ). The material was divided into four groups on the basis of pH: extremely PSE ( $pH_1$  5,3 - 5,4), PSE ( $pH_1$  5,6 - 5,7), "normal" pH ( $pH_1$  5,9 - 6,0) and "high" pH ( $pH_1$  > 6,35). Each group contained six pigs, from which boneless ham was trimmed, injection salted (brine containing 4,6 % phosphate, 15 % salt and 0,05 % sodium nitrite), tumbled in a vacuum (15 min), stored overnight, strung in a net and ripened (drying and smoking for 2,5 hours at 80°C and cooking for 3 h at 85°C). The water, protein, salt and phosphate contents of the trimmed, salted, ripe ham were determined. The water-binding capacity of the trimmed ham was also determined (2).

Extremely PSE meat and "normal" pH meat was cut from the front legs of two PSE and two normal pigs and used for water-binding capacity determination (2) and to prepare a series of cooked sausages containing various amounts of water (table 1)

Table 1. Recipe for the cooked sausage emulsion, and the amounts of water added.

	%				%	
pork	37,2		salt		2,1	
pork fat	14,5		phosphate		0,23	
water	see below <sup>1</sup>		nitrite		0,15	
dried milk	4,1		robio1		0,21	
potato flour	6,2		spices		0,21	
<sup>1</sup> Added water, %	34,4	37,4	40,3	43,3	46,2	50,2

The fat content of the non-precured cuts were made constant prior to preparation of the cooked sausage. The sausages were prepared four days after slaughtering the pigs. Additives were mixed into the emulsion along with the added water. Each batch of sausage contained the same amount of pork. Two series, each consisting of six sausages, were prepared using different amounts of water from both PSE and "normal" pork. The chopped (Seydelman) emulsion (c. 5 kg) was stuffed into Naturin casing, pre-dried, smoked and cooked for 45 min at 74°C (Foodco). The final consistency of the sausages was measured using an Instron consistometer.

## Results and discussion

### 1. Water-binding capacity

The water-binding capacity of PSE pork was found to be poorer than normal. The results agree with those presented in the literature in that the PSE phenomenon was found to be most pronounced in valuable muscle. The water-binding capacity of ham prepared from extremely PSE pork (pH<sub>1</sub> 5,3 - 5,4) was about 33 % below that of "normal" meat (pH<sub>1</sub> 5,9 - 6,0) while that of front leg meat was about 11 % below normal (Table 2). The addition of phosphate did not improve the water-binding capacity of PSE meat.

Table 2. Water-binding capacity of PSE pork. For the determination, 0,34 % phosphate was added. Ham = ham prior to injection.

Sample	pH <sub>1</sub> (m. gluteus medius)	Water-binding capacity
		%
Ham	5,3 - 5,4	56
"	5,6 - 5,7	80
"	5,9 - 6,0	83
"	> 6,35	102
Front leg	5,3 - 5,4	59
"	5,9 - 6,0	66

The theoretical water-binding values (%) of PSE and "normal" pork were calculated from the consistency measurements (Fig. 1). These were based on the fact, that the amount of added water corresponding to acceptable consistency (11,8 N) was 1,9 percentage points higher in sausage prepared from "normal" pork than in PSE pork sausage. A value of 85 % was obtained for PSE pork and 97 % for "normal" pork.

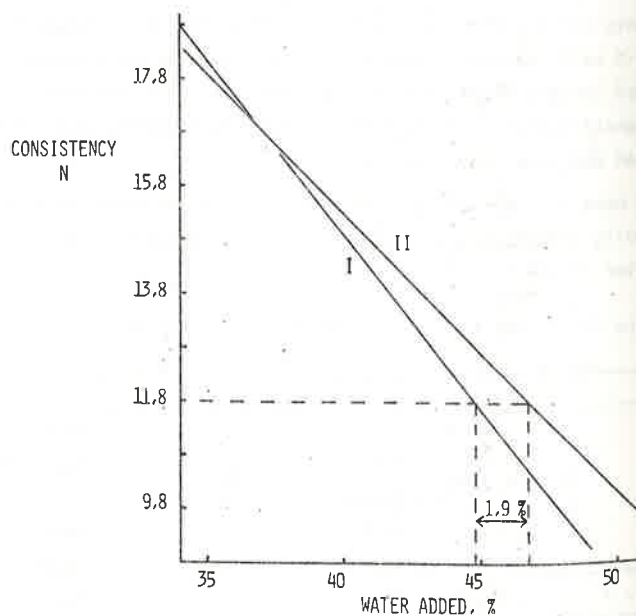


Fig. 1. Effect of addition of water on the consistency of cooked sausage prepared from PSE pork (I) and normal pork (II).

### 2. Quality of hams and sausages

The water content of smoked ham prepared from extremely PSE meat was about 2 percentage points lower than that of the other hams, while its protein content was about 2 percentage points higher than normal. There were no differences in the salt contents of the hams (Table 3). The ham prepared from extremely PSE pork was described in a sensory evaluation to be soft, crumbly and exudative in texture and to have a salty taste (Table 3). Neither did the sausages prepared from normal and PSE pork differ in terms of their chemical composition or quality as judged by sensory evaluation (Table 3). Addition of more than the usual

amount of water (40,3 %) to sausages prepared from PSE meat caused them to lose their consistency more rapidly than normal (Fig. 1).

Table 3. Chemical composition and sensorily evaluated quality of smoked hams and cooked sausages. Added water content was in sausages 34,4 %.

Sample	pH <sub>1</sub> of m. gluteus medius	Water %	Protein %	Fat %	Salt %	Added P <sub>2</sub> O <sub>5</sub> %	Organoleptic quality	
							total scores <sup>a</sup>	comments
Smoked ham	5,3 - 5,4	72	20	3	3	0,28	10,5	exudative, crumbly, salty
"	5,6 - 5,7	74	18	3	3	0,32	12,0	slightly exudative
"	5,9 - 6,0	74	18	4	3	0,30	11,5	slightly exudative
"	> 6,35	75	18	3	3	0,38	13,0	-
Cooked sausage	5,3 - 5,4	63	10	18	2	-	-	} no differences
"	5,9 - 6,0	63	10	17	2	-	-	

<sup>a</sup>) Appearance scored on a 3-point scale (3 = typical), texture scored on a 5-point scale (5 = most desirable) and taste scored on a 7-point scale (7 = most desirable). Total scores 9 - 11,5 for satisfactory and 12 - 15 for good ham.

### 3. Yields of ham and PSE meat in the sausage recipe

The yields of smoked hams are presented in Table 4. The table shows that 100 kg of boneless ham yields 105,6 kg of product in the case of normal meat (pH<sub>1</sub> 5,9 - 6,0) and 100,9 kg of product in the case of extremely PSE meat (pH<sub>1</sub> 5,3 - 5,4). Compared to the normal the factory loses 4,7 kg in the PSE product.

Table 4. Yields of smoked ham.

Batch no.	pH <sub>1</sub> (m. gluteus medius)	Yield
		%
1	5,3 - 5,4	100,9
2	5,6 - 5,7	106,1
3	5,9 - 6,0	105,6
4	> 6,35	108,4

The poor water-binding capacity of sausage brought about by the use of PSE pork causes problems in the sausage factory. In order to keep constant the proportion of pork and pork-bound water used in the recipe, the amount of PSE meat (pH<sub>1</sub> 5,3 - 5,4) should exceed that of normal meat (pH<sub>1</sub> 5,9 - 6,0) by 1,5 percentage points (Table 5).

Table 5. Proportions of pork and pork-bound water in the sausage recipe. pH limits as above.

Meat	Pork in recipe %	Pork-bound water %	Total in recipe %
Extremely PSE	26,5	22,6	49,1
Normal	25,0	24,1	49,1

#### References

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