8-5 "INFLUENCE OF THE USE OF DIFFERENT DRIED PLASMA PREPARATIONS ONTO SENSORIC PROPERTIES OF SOME MEAT PRODUCTS" x

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1. Introduction

Fresh blood plasma finds its greatest application in meat processing industry but its use is connected with many technological problems. It has, indeed, a number of desirable properties /e.g. emulsifying capacity and gel forming properties/, but contains a relatively small amount of protein /approx: 7%/ associated with a high content of water. This results in:

- low storage-life of fresh plasma,
- difficulties in the elaboration of good recipe of the product,
- restrictions concerning its addition to food /1/.

These drawbacks can be diminished by a partial or complete dehydration of blood plasma. The drying procedure is used mainly in this case /2,3/.

The findings of our previous experiments /4/ indicated, however, that each of the used drying techniques affected the main physical, chemical and nutritive properties of plasma preparations in quite different way.

The aim of this paper is to compare the effect of dried blood plasma preparations on the sensory quality of some model meat products.

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2. Material and methods

Our investigations were performed with two kinds of meat products produced in a pilot plant. Due to their popularity by consumer, "bologna" was used as a model sausage and "Luncheon Meat" functioned as a model canned product.

Investigations were carried out on dry samples prepared from fresh, liquied bovine blood plasma of food grade. Several samples were obtained in various drying conditions. The variable elements were:

- for spray drying: temperature of the top part /160-225°C/,
  temperature of the bottom part /75-80°C/,
- for drum drying: temperature of the drum /155-190°C/,
  drum rotations /3,0-12,0 r.p.m./,
  starch additive /0-17%/,
- for freeze drying: temperature of freezing and heating and time.

However, in this paper data of four preparations only are presented, but in the final conclusions all the experimental samples were taken into consideration. Finally, the followings typical preparations were chosen:

a/ spray dried plasma powder /SDP/, protein content 70,2%,
b/ drum dried plasma preparation /DDP-1/, protein content 70,9%
c/ drum dried plasma preparation with 5% of potato starch, added prior to drying procedure /DDP-2/, protein content 39,8%,
d/ freeze dried plasma preparation /FDP/, protein content 71,1%.

The examined plasma preparations were used as substitutes of meat protein and the product recipes were calculated in such a way to obtain the same protein and fat content in all experimental products. Meat protein was substituted in products in the range from 0 /control/ to 30%.

The sensory evaluation was performed by comparing properties of all model meat products. The following parameters were tested: color /cross-section of product/, juiciness, tenderness, taste, odor and overall acceptabillity. The sausages were tested in the room temperature and after heating them in water up 40°C. The five-point scale was used /1-means the worst quality, 5-the best/. All samples were evaluated by a six-number panel. All investigations were carried out in 3 series. In this paper average experimental results are given, subjected to statistical analysis /5/.

3. Results

a/ Evaluation of the sausage quality

The experimental findings presented in table 1 indicate that each of the plasma preparations used affected the main sensory properties of model sausage. These plasma preparations can be divided, in a simpliefied way, into two categories with different effect on the finished products, i.e.

- spray- and freeze dried, and
- drum dried.

The spray- and freeze dried preparations generally improved parameters closly to physical and chemical properties of the sausages /f.e. color/, but affected in a negative way their taste and odor. It was noted particularly during sensory testing of sausages containing spray-dried plasma preparations and hot served. In the products with the use of more than 20% meat protein substitute, the consumer acceptability was usually not obtained. In the freeze-dried preparations, the flavor was a critical factor. Also in this case the level of 20% of plasma proteins was found as maximal.

As the second group the drum-dried preparations with or without starch added were found. The sausages containing these preparations demonstrated a considerably better flavor but associated with deteriorated color and juiciness. Meat products containing plasma preparations with starch additive demonstrated an underisable lighter color. Only slight color changes were observed in the case of preparations without starch. The decreased juiciness found in the sausages containing starchless preparations was associated with a "granular" structure. These problems were not observed in the sausage with plasma preparation proteins below 20%.

Overall acceptability of investigated "bologna" sausages with dried plasma preparations used are shown on fig. 1.

Table 1. Sensory evaluation of the experimental "bologna" sausages with dried plasma preparation added

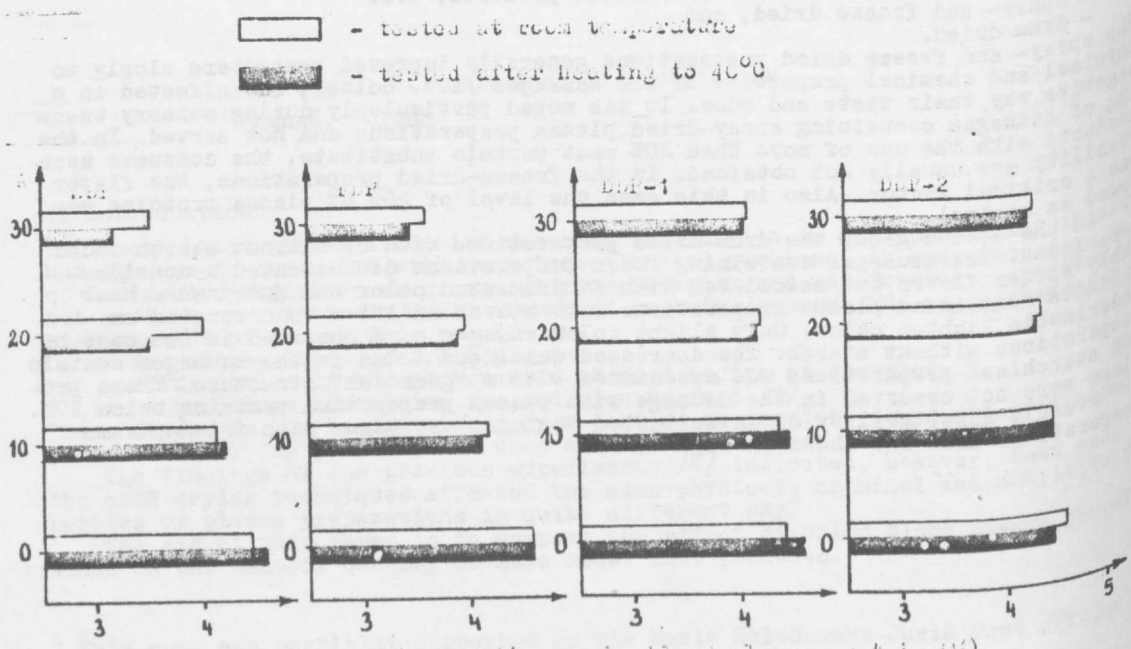
Preparation	A	Color		Tenderness		Odor		Taste		Juiciness	
		a	b	a	b	a	b	a	b	a	b
SDP	0	4,35	4,25	4,55	4,40	4,20	4,35	4,55	4,45	4,45	4,35
	10	4,20	4,25	4,60	4,50	4,10	4,10	4,00	3,95	4,50	4,45
	20	4,25	4,30	4,45	4,10	4,00	3,85	3,80	3,60	4,40	4,40
	30	4,10	4,20	4,10	4,00	3,95	3,10	3,45	3,20	4,35	4,20
FDP	0	4,55	4,35	4,40	4,40	4,35	4,40	4,45	4,35	4,55	4,45
	10	4,40	4,30	4,25	4,15	4,15	4,10	4,10	4,00	4,40	4,40
	20	4,25	4,25	4,15	4,00	4,00	3,95	3,90	3,85	4,30	4,35
	30	4,25	4,15	4,00	3,90	3,90	3,75	3,65	3,25	4,15	4,25
DDP-1	0	4,45	4,55	4,55	4,55	4,35	4,45	4,35	4,55	4,55	4,55
	10	4,55	4,45	4,60	4,55	4,30	4,25	4,20	4,15	4,15	4,10
	20	4,35	4,45	4,60	4,35	4,25	4,10	4,10	4,10	4,10	4,00
	30	4,25	4,35	4,35	4,35	4,10	4,00	4,10	4,00	4,00	3,85
DDP-2	0	4,45	4,35	4,45	4,55	4,45	4,45	4,35	4,55	4,35	4,35
	10	4,40	4,25	4,55	4,45	4,55	4,45	4,25	4,35	4,45	4,35
	20	4,25	4,15	4,35	4,35	4,45	4,35	4,15	4,25	4,25	4,15
	30	4,00	4,00	4,30	4,10	4,25	4,15	4,15	4,15	4,15	4,25

A - amount of meat protein substituted by blood plasma /%/.

a - conditions of the sensory evaluation of sausages /tested at room temperature/

b - conditions of the sensory evaluation of sausages /tested after heating to 40°C/.

Fig. 1. Overall acceptability of "bologna" sausages with the dried plasma used



... meat protein substituted by blood plasma protein (%)

b/ Evaluation of the canned meat quality

The results of sensory evaluation of canned meat with plasma preparations used are shown in table 2.

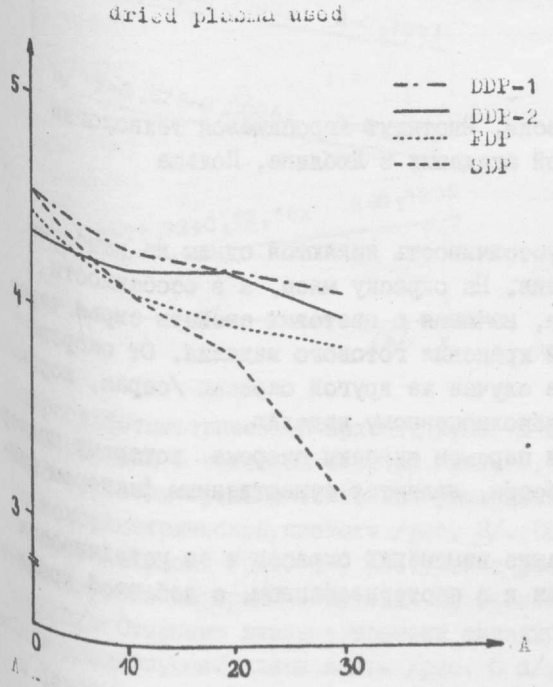
The results were similar to those in sausage evaluation. The use of spray- and freeze-dried preparations in canned meat production resulted in a deterioration of taste and odor of the product but the undesirable changes were found more prononunced. For example, the use of 20% spray-dried plasma proteins as meat protein substitute was found not acceptable. Much better results were obtained with the drum-dried preparations, which could be used in quantities up to 30%. A good ilustration for this conclusion gives figure 2.

Table 2. Sensory evaluation of the experimental "Luncheon Meats" with dried plasma preparations used

Preparation	A	Color	Tenderness	Odor	Taste	Juiciness
SDP	0	4,40	4,35	4,55	4,35	4,45
	10	4,40	4,40	4,15	4,15	4,25
	20	4,25	4,25	3,80	4,00	4,35
	30	4,15	4,15	3,05	3,75	4,15
FDP	0	4,35	4,55	4,45	4,50	4,35
	10	4,15	4,35	4,25	4,15	4,15
	20	4,15	4,25	4,00	4,15	4,25
	30	4,05	4,15	3,85	4,05	4,15
DDP-1	0	4,45	4,65	4,55	4,45	4,45
	10	4,25	4,45	4,35	4,45	4,35
	20	4,10	4,35	4,25	4,30	4,15
	30	4,00	4,15	4,15	4,25	4,05
DDP-2	0	4,55	4,35	4,55	4,35	4,40
	10	4,45	4,25	4,35	4,35	4,25
	20	4,15	4,15	4,25	4,25	4,25
	30	4,00	4,15	4,15	4,25	4,15

A - amount of meat protein substituted by blood plasma /%/.

Fig. 2. Overall acceptability of "Luncheon Meats" with the dried plasma used



A - amount of meat protein substituted by blood plasma protein (%)

4. Conclusions

a/ The experimental findings indicate the possibility of the use of dried plasma as a substitute of meat protein. However, the optimal range of application of the plasma preparations is greatly dependent on the drying technique.

b/ The freeze-dried and spray-dried preparations, due to their functional properties, can be used primarily in sausage production, while in the production of canned, steriliesed meat products better results are obtained with the use of drum dried preparations.

c/ Flavor is the most critical factor limiting the range of application of dried plasma preparations in meat processing. Special attention should be paid to the flavor of plasma preparations.

R e f e r e n c e s

1. Uchman W., Chalcarz W., Skalski J.: "Krew zwierząt rzeźnych i jej wykorzystanie", PWRiL, Poznań, 1978,

2. Uchman W., Chalcarz W., Pezacki W.: "Verwendung von Schlachttierblut für die menschliche Ernährung", Fleischwirtschaft 59, 730, 1979,

3. Langhoff L.: "Gewinnung und Trockung von Schlachttierblut zur menschlichen Ernährung", Industrie Alimentari, 19, 922, 1980,

4. Uchman W. at al.: "Investigations of the influence of various concentrations of bovine blood preparations on some meat products properties' Project PL-ARS-108, Second Annual Report, 1981,

5. Snedecor G.W.: "Statistical methods", 5th ed., Iowa State Coll. Press, Iowa, 1956.