IMPACT OF COLLAGENOUS PREPARATE ON SELECTED TECHNOLOGICAL INDICES OF COMMINUTED, SCALDED SAUSAGES.

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BACKGROUND.

There are nutritional and economic reasons for focusing the attention of food technologists on manufacturing the products low in fat and salt, but exhibiting high yield. However, increasing added water beyond traditional levels alters the sausage batter system. The inability of meat proteins to bind increased amounts of water may explain excess purge, high yield loss and decreased textural qualities of high moisture type sausages. One possible way to compensate for decreases in the favourable characteristics of sausages has been extended using of non-meat ingredients, both plant and animal origin, such as starches, hydrocolloids, soy flour, whey proteins, collagen preparates etc. (1, 2, 6, 8, 9, 11, 14).

OBJECTIVE.

The objective of our study was to evaluate the feasibility of incorporating powdered pork rind (DRINDE 1015/F, Protein Foods Scandinavia A/S) in manufacturing of model, comminuted, scalded sausages and to examine its role in enhancing the production yield and textural properties.

METHODS

Model sausages were made from: 2nd grade beef - 40%, 2nd grade pork - 10%, 3rd grade pork - 10% and deskinned collar fat - 40%. The raw materials were comminuted in a laboratory grinder (plate of 2 mm holes) and then frozen at -22°C. Meat and fat were thawed at 4°C for 18 hr before processing. During the comminution in a bowl cutter 2.0 % NaCl brine chilled to -14°C, 125 ppm of $NaNO_2$ dissolved in water chilled to 2 °C, and 1:2 mole of sodium ascorbate in relation to nitrite was added. The spices used were pepper 0.10% and nutmeg 0.08%. Cellulose casings were 32 mm in diameter. Sausages were smoked and scalded in a programmed traditional smoking-cooking chamber until 70°C was reached in core and thereafter cooled down in cold running water for 5 min. and stored at 0-4 °C for approx. 72 hours. Response surface methodology (RSM) was used to study the technological effects of different amounts powdered pork rind and water addition i.e. 0%, 2 % and 4% and 50%, 60% and 70%, respectively.(Table 1).

The following equation of function X1 and X2 was used: $Y = const + AAX1^2 + BBX2^2 + AX1 + BX2 + ABX1X2$. where: Y = dependent variable, A = rind powder, B = added water, X1 = value of factor 1 from Response Surface (-1, +1), X2 = value of factor 2 from Response Surface (-1, +1). Statistical analysis was done using the STATGRAPHIC v.7.0. The following variables were measured: production yield, dry matter, fat and protein contents (5), cooking loss (13), thermal drip (12), WHC (7). Colour and colour stability after 1,3 and 6 hours exposure of the sample to white fluorescent light approx. 250 Lux were evaluated using a reflectance colorimeter Minolta CR 200b. L*,a*,b*. "hue" and "chroma" were determined (10).The rheological properties were analysed according to texture profile analysis (TPA) using a Stevens - QTS 25 texturometer (4), and organoleptic parameters were analysed by multiple comparison and evaluation of desirability of: colour, odour, juiciness, saltiness, tenderness and palatability of the products using a 5 point scale (3).

Table 1. Specification matrix of second order of design x1 = DRINDE /%/; x2 = added water /%/

Assay No.	RSM CODE x1 x2	DRINDE (x1 %)	WATER (x2 %)
A1.	-1, -1	0	50
A2.	0, -1	2	50
A3.	1, -1	4	50
A4.	-1, 0	0	60
A5.	0, 0	2	60
A6.	0, 0	2	60
A7.	1, 0	4	60
A8.	-1, 1	0	70
A9.	0, 1	2	70
A10	1, 1	4	70

RSM CODE = Response Surface Methodology Code, A = Assay No.

Table 2. Coefficients of quadratic equation for selected variables model sausages

Variables	Constant	A	B	AB	AA	BB
Production yield %	173.39	0.64	-1.64	0.03	0.07	0.02
Thermal drip %	47.46	-1.64	-1.53	0.02	-0.02	0.01
Cooking loss %	8.18	1.08	-0.17	-0.01	-0.12	0.002
WHC %	41.06	4.04	0.19	-0.008	0.12	-0.003
Hardness [N]	-60.40	8.55	3.12	-0.13	-0.30	-0.03
Fracturability [N]	-116.08	5.10	4.83	-0.04	-0.43	-0.04
Springiness	1.26	0.01	-0.02	0.0009	-0.008	0.0001
L*	55.34	0.89	0.26	-0.01	-0.11	-0.002
a*	12.15	-0.67	0.09	0.003	0.08	-0.0008
b*	18.94	-0.81	-0.30	0.007	0..09	0.002

RESULTS and DISCUSSION.

In this paper only selected results and discussion will be presented. Table 2 shows coefficients of quadratic equation for selected variables of model comminuted, scalded sausages processed with pork rind protein and water added in the amounts chosen for the experiment. The experimental results show that powdered rind favourably influence production yield at all levels of added water. The highest value of this parameter (169,24%) was recorded for sausages manufactured with 4% DRINDE and 70% added water, while the value predicted by RSM was 170,47%. The largest thermal drip i.e. 12,24% was determined for sausages processed without rind protein and 70% added water /A8/. The smallest thermal drip was observed for sausages manufactured with 50% added water and 4% collagenous additive /A3/. The best results had been predicted for sausages processed with 50-60 % water addition and 2-4% DRINDE preparate. The smallest cooking loss, both predicted by RSM and recorded in experiment, was for sausages processed with 4% of rind protein and 50-60 % added water. The addition of collagenous preparate was the most effective when the amount of added water did not exceed 60 %. Both DRINDE preparate and water addition significantly affected WHC determined for experimental sausages. The best results, according to RSM, had been reported for sausages processed with 4% rind protein and 50-60% added water. The smallest values of this parameter were observed for sausages manufactured without powdered rind and 70% water addition. The sausages processed with rind protein and 70% water addition exhibit smaller hardness in relation to ones manufactured without additives. This rheological variable also depends on the amounts of water used, particularly at 4% addition of DRINDE varying from 14,52 N (A3) to 27,92 N (A10). The data determined for fracturability were only slightly influenced by collagenous additive used, while the amount of water added had no effect on values of this parameter. The greatest fracturability force was observed for sausages processed with 2-4% of added rind protein and 50-60% water addition. There was no difference reported in forces required to fracture the sausages processed with 70% water added. Increased collagen protein contribution in sausages composition to 4% resulted in nearly 20% higher values of springiness in comparison to control batches with 0% level of DRINDE addition. No significant effect both water and powdered rind addition on the lightness parameter /L*/ was observed. However, it could be noticed slightly darkening of sausages with increasing level of added preparate resulting in lower values of L* parameter. Rind powder addition appeared to have strong influence on the a* parameter of sausage colour i.e. redness at all levels of added water. This resulted in recording the lowest values of a* parameter for sausages with 2 and 4% powdered rind addition. The best redness of sausages was observed for sausages manufactured with no collagenous additive. The smallest yellowness of sausages (b*parameter) was recorded when they were processed with 2% addition of rind protein and 55-65% of water. The average results of organoleptic evaluation indicate that the best sausages were processed when the addition of DRINDE preparate and water did not exceed 2% and 60%, respectively.

CONCLUSIONS.

1. The rind protein as a recipe component of batter (2.0-4.0%) favourably affected WHC and thermal stability of sausages processed with 50-60% of water added during comminution.
2. No significant influence of powdered rind on L* and b* sausage colour parameters was observed, while the redness of the sausages with DRINDE addition was unfavourably smaller in comparison to ones manufactured without collagen protein.
3. Addition of experimental protein preparate affects the sausage texture, but the effect depends on the amount of the additive used.

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