Optimization of textural parameters of pork spread coagulates with addition of various starches and flour types

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Originalni znanstveni rad

SUMMARY

The aim of the study was to produce pork spread coagulates by adding some substitutes that would have comparable or even better textural properties as spread produced with phosphates. For this purpose, we have prepared fourteen groups of spreads, in which phosphate mixture (control) was replaced with different starches (potato starch, instant potato starch and corn starch) or flour (buckwheat flour, whole grain spelt flour, chickpea flour, rice flour, wheat flour, barley flour with the addition of β-glucans and different fractions of coconut flour). Prepared pork spreads were sensory evaluated, colour was measured with Minolta, and textural parameters were determined with Texture Analyser TA.XT. Spreads with different starches, flour and phosphates significantly ($P \leq 0.001$) differed in instrumentally measured texture (firmness, consistency, cohesiveness, and index of viscosity) and all colour values as well as in sensory properties (appearance, texture, smell and aroma). Spread with phosphates and spread with corn starch were the most similar in overall sensory quality. Because of its attractive properties also spread with coconut flour 140 was interesting.

Key words: *meat products, spread coagulates, phosphates, starch, flour, texture parameters*

INTRODUCTION

According to the Rules on the quality of meat products (2012) spread coagulates or pâté belong in a group of pasteurized meat products, a subgroup of cooked sausages, and are heat treated to an internal temperature of <100 °C, usually up to 72 °C, at which technologically harmful organisms, pathogens microorganisms and enzymes are destroyed (Feiner, 2006) and then stuffed into natural or artificial casings or other packaging.

In addition to meat and non-meat additives (spices, herbs, vegetables, etc.) also fat (bacon or oil), water or meat broth, corresponding additives (nitrite salt, etc.) and phosphates (E 338-343, E 450-452) represent raw material in the production of meat spreads. Phosphates are widely used especially in the manufacturing technology including heat treatment (Petracci et al., 2013). According to Regulation on food additives (2010), the final product should not contain more than 0.5% (up to 5 g/kg) of the total phosphates, expressed as phosphorus pentoxide - P2O5.

Phosphates return proteins swelling capability and thus increase the ability to bind water which results in better sensory quality and higher yield in meat products processing (Xiong, 2012). When phosphates are added to a meat product, they inhibit the development of oxidative rancidity, act against bacteria growth, promote the development of curing colour and indirectly act as emulsifiers (Gašperlin and Polak, 2010).

Higher quantities of added phosphates in meat products can cause an unpleasant soapy, bitter aftertaste, firm and rubber textural properties (Gašperlin and Rajar, 2008). Phosphates are problematic from a health perspective, to this end researchers are intensively looking for phosphates alternatives. In addition to hydrocolloids especially different starches provide positive effects (Agar Mitolo, 2006; Resconti et al., 2016).

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The aim of present study was to produce the pork spread coagulates by adding different substitutes to achieve similar or even better textural properties compared to a pork spread produced with phosphates. For this purpose, we have prepared fourteen groups of spreads, where instead of phosphate mixture (control), different variety of starches (potato starch, instant potato starch (Babić et al., 2013), corn starch (Bortnowska et al., 2013; Genccelep et al., 2015) and different types of flour (buckwheat flour, whole grain spelt flour, chickpea flour, rice flour, wheat flour, barley flour with addition of β-glucans (Amini Sarteshnizi et al., 2015) and different fractions of coconut flour (Heinz and Hautzinger, 2007) were added.

MATERIAL AND METHODS

Spread coagulates preparation

Spread coagulates were produced from phosphates (control spread), different variety of starches (potato starch, instant potato starch and corn starch) or different types of flour (buckwheat flour, whole grain spelt flour, chickpea flour, rice flour, wheat flour, barley flour with the addition of β-glucans and different fractions (140, 250, 355, residue) of coconut flour).

Control meat spread coagulate was made of 38.5% pork neck, 25% sunflower oil, 35% water, 0.5% phosphate mixture, 1% nitrite salt, 0.2% seasoning mixture and 1% caseinate. Spread coagulates contained 6% each type of starch/flour instead of phosphate mixture and 0.03% sodium erythorbate to replace caseinat. Percent of other ingredients was the same compared to control spreads. There have been produced fourteen types of meat spread coagulates in three production replications. During constant stirring, minced meat together with nitrite salt and water was heat treated until temperature of 70-80 °C was reached. Cooked meat was transferred into Stephan UMC 5 electronic (Stephan Nahrungsmittel und Verfahrenstechnik, Germany) and homogenized for 2 min at 2400 × rpm. Then phosphate mixture, seasoning mixture and caseinate were added and homogenized for 1 min at 2400 × rpm. At the end heated sunflower oil was added, the mixture was homogenized for 5 min at 3000 × rpm and then filled in glass jars. Prepared meat spreads were cooled to room temperature and held overnight in a refrigerator at 4 °C. Next day coagulates were pasteurized in a combi-appliance SelfCooking Center® 5 senses (Rational) according to the following temperature regime: 30 minutes at a temperature of 40 °C for the next 30 minutes at a temperature of 60 °C and 30 minutes at a temperature of 72 °C. Then the samples were cooled to room temperature and stored in a refrigerator at 4 °C until further analysis (Figure 1).

From the left side: control, potato starch, instant potato starch, corn starch, buckwheat flour, whole grain spelt flour, chickpea flour, rice flour, wheat flour, barley flour, coconut flour 140, coconut flour 250, coconut flour 355, coconut flour residue.

Figure 1. Two production replications of pork spread coagulates with added different types o f flour and starches.

Methods

Basic chemical composition was determined in duplicate by apparatus Food ScanTM Meat Analyser (FOSS), specifically designed for meat and meat products.

Instrumental analysis of colour were determined in duplicate with chromometer Minolta CR-200b and the CIE L^* a^* b^* system was used (L^* (lightness), a^* (±, red to green) and b^* (±, yellow to blue) values on the surface and cross-section of the sample).

Textural properties of spread coagulates were measured in duplicate with apparatus Texture Analyser TA.XT Plus and contact part SMSP/20.

Sensory evaluation was carried out by a panel of five qualified and experienced panellists in the field of meat products. The analytical-descriptive test (Golob et al., 2005) was used. The analysis was performed by scoring the sensory attributes on a structured scale from 1 to 7 points, where a higher score indicated greater expression of a given property. The exceptions here were saltiness and hardness, which were evaluated by scoring on a structured scale of 1 to 4 to 7 (1-4-7). Here, a score of 4 points was considered optimal, with scores of 4.5 or higher indicating greater expression of a property, and those of 3.5 or lower indicating insufficient expression of a property. These sensory profiles of the spread samples were assessed using 14 descriptors that were grouped into four blocks: appearance, texture, smell and aroma. The first block related to the visual attributes and the cross-section: colour, oxidation rate, segregated liquid, and stability of emulsion. The second block related to the texture: juiciness, hardness, jelly, spreadability and graininess. The third block related to the olfactory attributes, like smell characteristic and odour. The fourth block related to the aroma attributes, such as saltiness, aroma characteristic and odd aroma. The appearance and segregated liquid were evaluated in glass jars. Other properties were evaluated on spreads offered on the plates.

Data analysis

The data were analysed for normal distributions using the UNIVARIATE procedure (SAS/STAT, USA). The differences according to the muscles were analysed through

a general linear model procedure and Duncan test (SAS/STAT), with a 0.05 level of significance. The experiment was performed in three production replications.

RESULTS AND DISCUSSION

Basic chemical parameters were determined for all of the experimental groups. On average, 100 g of spread coagulate contained water at 58.04 ± 0.32 g, fat at 27.35 ± 0.39 g, protein at 9.45 ±0.11 g, salt at 0.82 ± 0.19 g and collagen at 0.85 ± 0.29 g (data not shown). On the basic of the standard deviations for each parameter obtained we could confirm the homogeneity of the samples.

Instrumental measurement of surface and cross-section colour shown that spread coagulates with the addition of various starches or flour were generally darker (lower *L** values) (exception was chickpea flour which made the spread brighter on surface), redder (higher *a** values) and less yellow (lower *b** values) compared to control coagulates with the addition of phosphate mixture (Table 1).

Table 1. Effect of different flour/starch type addition on the colour measured with chromometer Minolta on the surface and cross-section of spread coagulates.

Spread	Surface			Cross-section		
Starch/flour type	**L***	**a***	**b***	**L***	**a***	**b***
Control	78.50^{a}	3.82^{g}	11.68^{b}	77.92^{a}	6.21^{j}	9.94^{cb}
Potato starch	65.79^{g}	5.07^{e}	10.65^{d}	68.55^{j}	8.22^{ed}	7.89^{f}
Instant potato starch	63.43^{h}	5.66^{dc}	7.81^{h}	66.67^{k}	7.25^{h}	8.06^{ef}
Corn starch	72.55^{cb}	4.67^{f}	10.99^{c}	72.34^{ed}	7.91^{f}	8.12^{ef}
Buckwheat flour	69.50^{ef}	5.36^{d}	9.01^{g}	70.50^{g}	7.76^{g}	8.83^{d}
Whole grain spelt flour	68.72^{f}	5.44^{d}	10.11^{e}	69.30^{i}	7.08^{i}	10.23^{b}
Chickpea flour	78.40^{a}	1.35^{h}	13.07^{a}	75.59^{b}	4.00^{k}	13.62^{a}
Rice flour	70.60^{ed}	5.56^{dc}	9.36^{f}	72.14^{e}	7.80^{g}	8.47^{ed}
Wheat flour	70.04^{ef}	5.54^{dc}	10.11^{e}	69.80^{h}	8.77^{a}	8.97^{d}
Barley flour	61.63^{i}	5.84^{c}	8.93^{g}	66.80^{k}	8.67^{b}	10.12^{b}
Coconut flour 140	72.65^{cb}	7.02^{b}	9.21^{gf}	73.03^{c}	8.17^{e}	9.51^{c}
Coconut flour 250	72.95^{b}	7.38^{a}	9.19^{gf}	72.60^{d}	8.47^{c}	9.52^{c}
Coconut flour 355	72.51^{cb}	7.10^{ba}	9.09^{gf}	72.32^{ed}	8.31^{d}	8.92^{d}
Coconut flour residue	71.51^{cd}	7.29^{ba}	9.04^{g}	71.51^{f}	8.32^{d}	8.57^{ed}
SD	1.58	0.35	0.34	0.36	0.12	0.63
P_v	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
P_p	< 0.001	0.001	< 0.001	< 0.001	< 0.001	0.007

SD – standard deviation of three independent experiments; P_v – statistical probability of flour/starch type effect; P_p – statistical probability of repetition effect; means with different superscript letters (a,b,c,d,e,f,g,h,i,j) within column differ significantly (P ≤0.05; significance of differences between flour/starch types addition).

On the other side, panellists have decided the spread with chickpea flour had the most similar colour compared to control spread. All other spreads were redder and therefore sensory acceptable (Table 3). Spread coagulates with addition of potato starch (6.1 points), potato instant starch (6.0 points) and barley flour (6.1 points) were assessed as the most likeable choise ragarding colour. The highest oxidation rate on the surface was observed in previous mentioned spreads with barley flour (3.3 points), potato starch (3.2) and corn starch (3.3).

Spreads with different starches, flour of phosphates significantly ($P \leq 0.001$) differed in instrumentally measured textural parameters (firmness, consistency, cohesiveness, and viscosity index) (Table 2). Spreads with comparable firmness to control (3.42 N) were those with addition of corn starch (3.39 N), wheat flour (3.52 N), barley flour (3.44 N) and coconut flour 355 (3.31 N).

Table 2. Effect of different flour/starch type addition on the textural parameters of spread coagulates measured with Texture analyser.

Starch/flour type	Firmness (N)	Consistency (N.s)	Cohesiveness (N)	Viscosity index (N.s)
Control	3.42^{hg}	60.43^{fg}	$-3.13b^{a}$	-3.07^{a}
Potato starch	6.27^{a}	101.12^{a}	-5.96^{e}	-6.03^{g}
Instant potato starch	2.41^{j}	43.04^{i}	$-3.37b^{c}$	-3.58^{bac}
Corn starch	3.39^{hg}	$63.32f^{e}$	$-3.46b^{c}$	$-3.80b^{dac}$
Buckwheat flour	5.69^{b}	102.67^{a}	-5.90^{e}	-5.64^{fg}
Whole grain spelt flour	3.18^{i}	57.97^{g}	$-3.84d^{c}$	-4.24^{dc}
Chickpea flour	3.78^{f}	70.22^{d}	-3.22^{ba}	-3.44^{bac}
Rice flour	3.99^{e}	70.73^{d}	-4.28^{d}	-5.05^{fe}
Wheat flour	3.52^{g}	$60.45f^{g}$	-4.24^{d}	-4.42^{de}
Barley flour	$3.44h^{g}$	50.84^{h}	-3.86^{dc}	-3.51^{bac}
Coconut flour 140	4.21^{d}	76.80^{c}	-3.26^{ba}	-3.81^{bdac}
Coconut flour 250	4.80^{c}	87.87^{b}	-3.56^{bc}	-4.02^{bdc}
Coconut flour 355	$3.31h^{i}$	$60.53f^{g}$	-2.73^{a}	-3.40^{bac}
Coconut flour residue	3.69^{f}	66.36^{e}	-3.07^{ba}	-3.35^{ba}
SD	0.21	4.75	0.61	0.92
P_v	< 0.001	< 0.001	< 0.001	< 0.001
P_p	< 0.001	< 0.001	< 0.001	< 0.001

SD – standard deviation of three independent experiments; P_v – statistical probability of flour/starch type effect; P_p – statistical probability of repetition effect; means with different superscript letters (a,b,c,d,e,f,g,h,i,j) within column differ significantly (P ≤0.05; significance of differences between flour/starch types addition).

Texture in the mouth was evaluated by panellists according to five characteristics, as juiciness, hardness, spreadability, jelly and granularity, where coagulates with addition of corn starch, coconut flour with granulation 140 and potato starch were the most juicy compared to control spread, where juiciness was assessed with 7.0 points (Table 3, 4). In general, addition of various flour/starch significantly decreased juiciness.

Control spread was slightly too soft (hardness was assessed with 3.2 points) while addition of potato starch and coconut flour 250 was assessed with higher score of hardness. Most likeable speadability was observed in addition of wheat flour and barley flour. Addition of potato starch, corn starch, wheat flour and buckwheat flour was assessed as coagulates with the lowest granularity.

Table 3. Effect of different flour/starch type addition on the sensory properties of spread coagulates.

Starch/flour type	Value of property regarding the sample						
	Colour (1-7)	Oxidation rate of colour (1-7)	Segregated liquid (1-7)	Emulsion stability (1-7)	Juiciness (1-7)	Hardness (1-4-7)	Jelly (1-7)
Control	2.3^{d}	1.0^{f}	1.7^{dgef}	6.5^{a}	7.0^{a}	3.2^{c}	3.8^{a}
Potato starch	6.1^{a}	3.2^{a}	4.3^{a}	6.1^{b}	5.5^{ef}	4.0^{a}	1.8^{h}
Instant potato starch	6.0^{a}	2.1^{dc}	1.4^{g}	2.1^{j}	6.0^{cb}	2.7^{d}	3.1^{b}
Corn starch	5.5^{b}	3.3^{a}	2.0^{c}	4.4^{e}	6.3^{b}	2.5^{d}	2.9^{cb}
Buckwheat flour	5.1^{c}	2.6^{b}	1.6^{dgef}	5.1^{d}	5.5^{ed}	3.5^{bc}	1.9^{hg}
Whole spelt flour	5.0^{c}	1.9^{d}	1.8^{de}	3.1^{i}	5.6^{ed}	2.7^{d}	2.2^{efg}
Chickpea flour	1.1^{e}	1.0^{f}	1.8^{dc}	5.8^{c}	5.5^{ef}	2.8^{d}	2.2^{efg}
Rice flour	5.0^{c}	2.3^{c}	1.5^{gf}	4.5^{e}	5.7^{ed}	3.4^{bc}	2.3^{ef}
Wheat flour	5.4^{b}	2.1^{dc}	1.4^{g}	3.5^{h}	5.7^{ed}	2.8^{d}	2.5^{ed}
Barley flour	6.1^{a}	3.3^{a}	2.8^{b}	3.8^{g}	5.5^{ef}	3.3^{c}	2.8^{cd}
Coconut flour 140	5.0^{c}	1.3^{e}	1.7^{def}	5.3^{d}	6.2^{b}	3.5^{bc}	2.3^{ef}
Coconut flour 250	5.0^{c}	1.4^{e}	1.5^{gef}	6.1^{b}	5.8^{cd}	3.7^{ba}	2.4^{ef}
Coconut flour 355	5.1^{c}	1.4^{e}	1.5^{gf}	4.3^{fe}	5.8^{cd}	2.6^{d}	2.1^{hfg}
Coconut flour residue	4.9^{c}	1.5^{e}	1.5^{dgef}	4.1^{f}	5.3^{f}	2.5^{d}	1.8^{h}
SD	0.31	0.31	0.30	0.38	0.33	0.47	0.44
Pv	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Pp	0.595	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001

SD – standard deviation of three independent experiments; P_v – statistical probability of flour/starch type effect; P_p – statistical probability of repetition effect; means with different superscript letters (a,b,c,d,e,f,g,h,i,j) within column differ significantly (P ≤0.05; significance of differences between flour/starch types addition).

Table 4. Effect of different flour/starch type addition on the sensory properties of spread coagulates- continuation of Table 3.

Starch/flour type	Value of property regarding the sample						
	Spreadability (1-7)	Graininess (1-7)	Smell characteristic (1-7)	Odour (1-7)	Saltiness (1-4-7)	Aroma characteristic (1-7)	Odd aroma (1-7)
Control	5.8^{bc}	1.0^{i}	6.8^{a}	1.3^{h}	4.2^{a}	6.8^{a}	1.0^{j}
Potato starch	4.6^{d}	3.0^{c}	5.8^{cd}	1.9^{fde}	4.1^{bac}	5.4^{b}	2.4^{gh}
Instant potato starch	5.9^{b}	1.2^{i}	6.1^{b}	1.5^{gh}	4.0^{bc}	5.5^{b}	1.9^{i}
Corn starch	6.0^{ba}	1.6^{h}	6.0^{cb}	1.6^{fgh}	4.0^{c}	5.2^{b}	3.0^{ef}
Buckwheat flour	6.2^{ba}	1.9^{gh}	5.9^{cb}	1.5^{gh}	4.0^{bc}	4.5^{c}	3.4^{ed}
Whole grain spelt flour	6.0^{ba}	1.8^{gh}	6.1^{b}	1.8^{fge}	4.0^{c}	3.8^{ed}	4.0^{cb}
Chickpea flour	6.2^{ba}	2.0^{fgh}	2.8^{g}	5.8^{a}	4.0^{c}	2.1^{g}	6.0^{a}
Rice flour	6.0^{ba}	2.1^{fg}	6.1^{b}	1.5^{gh}	4.1^{bac}	5.3^{b}	2.1^{ih}
Wheat flour	5.9^{ba}	1.7^{gh}	5.6^{fde}	1.9^{fde}	4.1^{bac}	4.8^{c}	2.8^{gf}
Barley flour	5.8^{bc}	2.8^{dc}	5.4^{fe}	2.2^{cd}	4.1^{ba}	3.9^{d}	3.6^{cd}
Coconut flour 140	6.4^{a}	2.3^{fe}	5.4^{fe}	2.6^{b}	4.0^{c}	3.5^{ef}	4.3^{b}
Coconut flour 250	5.4^{c}	2.6^{de}	5.7^{cde}	2.2^{cde}	4.0^{c}	3.4^{f}	4.5^{b}
Coconut flour 355	6.2^{ba}	3.5^{b}	5.6^{fde}	2.2^{cde}	4.0^{c}	3.4^{f}	4.5^{b}
Coconut flour residue	6.1^{ba}	5.5^{a}	5.4^{f}	2.5^{cb}	4.0^{c}	3.4^{f}	4.5^{b}
SD	0.52	0.48	0.35	0.45	0.13	0.50	0.61
Pv	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001
Pp	< 0.001	< 0.001	< 0.001	0.131	0.054	0.153	0.442

SD – standard deviation of three independent experiments; P_v – statistical probability of flour/starch type effect; P_p – statistical probability of repetition effect; means with different superscript letters (a,b,c,d,e,f,g,h,i,j) within column differ significantly (P ≤0.05; significance of differences between flour/starch types addition).

The highest sensory evaluated stability of emulsion was observed in control spread (6.5 points). Slightly poor stability (but typical) had spread with potato starch and coconut flour 250 (6.1 point) and the worst stability was assessed in spread with instant potato starch (2.1 points) (Table 3, 4).

Most similar smell compared to control was determined for instant potato starch, corn starch, whole spelt flour, buckwheat and rice flour. Most similar aroma compared to control was reached with addition of potato starch, instant potato starch, corn starch and rice flour, the problem was the presence of odd flavour. Control spread and spread with corn starch were the most comparable in overall sensory quality. Also spread with coconut flour 140 was interesting, because of its attractive properties, especially aroma.

CONCLUSION

Complete exclusion of phosphates from meat industry is not realistic, because of its positive effects on technological properties. At least we need to reduce its use because of the problems from a health perspective. For this purpose we prepared meat spread coagulates with different types of starches and flour instead of phosphates. The results obtained shown that we could reach similar or even better quality of spread coagulates from a technological and sensory point of view.

**This article is part of a MSc. thesis named Optimization of texture parameters of pork-based spread coagulates made with different starches and flour types, issued by Noemi Pavlovič.*

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Delivered: 16.6.2017. **Accepted: 20.9.2017.**

Optimizacija parametara teksture pašteta od svinjetine uz dodatak različitih vrsta škroba i tipova brašna

SAŽETAK

Cilj ove studije bio je proizvesti paštetu od svinjetine dodavanjem zamjenskih tvari koje bi imale usporediva ili bolja teksturalna svojstva od pašteta proizvedenih uz dodatak fosfata. U tu svrhu, pripremljeno je četrnaest skupina pašteta u kojima je mješavina fosfata (kontrola) zamijenjena različitim vrstama škroba (krumpirov škrob, instant škrob krumpira i kukuruzni škrob) ili brašna (heljdino brašno, integralno brašno pira, brašno slanutka, rižino brašno, pšenično brašno, ječmeno brašno uz dodatak beta glukana i različitih frakcija kokosova brašna). Uzorci su ocijenjeni organoleptički, boja je izmjerena upotrebom Minolta uređaja a tekstura Analizatorom teksture TA.XT. Paštete s različitim vrstama škroba, brašnom i fosfatima značajno su se razlikovale ($P \leq 0,001$) u teksturi (čvrstoća, konzistencija, povezanost, te indeks viskoznosti), boji i senzornim svojstvima (izgled, tekstura, miris i aroma). Pašteta s fosfatima i pašteta s kukuruznim škrobom bile su najsličnije senzorne kvalitete. Zbog svojih privlačnih svojstava, ističe se pašteta s kokosovim brašnom 140.

Ključne riječi: *mesni proizvodi, paštete, fosfati, škrob, brašno, parametri teksture*

Optimierung der Texturparameter der Schweineleberwurst durch Zugabe von diversen Stärke- und Mehlsorten

ZUSAMMENFASSUNG

Ziel dieser Studie war es, eine Leberpastete aus Schweinefleisch durch Zugabe von einzelnen Ersatzstoffen herzustellen, die vergleichbare oder sogar noch bessere Textureigenschaften aufweisen würde als die mit Phosphaten hergestellte Leberwurst. Zu diesem Zweck wurden vierzehn Leberwurstgruppen vorbereitet, bei welchen die Phosphatmischung (Kontrolle) durch diverse Stärken (Kartoffelstärke, Instant-Stärke und Maisstärke) oder Mehl (Buchweizenmehl, Vollkorndinkelmehl, Kichererbsenmehl, Reismehl, Weizenmehl, Malzmehl bei Zugabe von Beta-Glukan und diverse Fraktionen von Kokosmehl) ersetzt wurde. Die zubereiteten Schweineleberwürste wurden sensorisch beurteilt; die Farbe wurde mit dem Kolorimeter Minolta gemessen, während die Textur mit dem Texturanalysegerät TA.XT festgelegt wurde. Bei den Leberwürsten mit diversen Stärkesorten ($P \leq 0,001$) haben sich erhebliche Unterschiede bei der instrumental gemessenen Textur (Festigkeit, Konsistenz, Kompaktheit und der Viskositätsindex), bei allen Farbwerten sowie sensorischen Eigenschaften (Aussehen, Textur, Geruch und Aroma) gezeigt. Die Leberwurst mit Phosphaten und die Leberwurst mit Maisstärke waren in Bezug auf die sensorische Qualität am ähnlichsten. Aufgrund ihrer attraktiven Merkmale zeigte sich die Leberwurst mit Kokosmehl 140 besonders interessant.

Schlüsselwörter: *Fleischprodukte, Leberwurst, Phosphate, Stärke, Mehl, Texturparameter*

Optimización de los parámetros de textura del paté de cerdo con addición de varios tipos de amildón y tipos de harina

RESUMEN

El objetivo de este estudio fue producir paté de cerdo mediante la adición de algunas sustancias sustitutivas que tendrían propiedades de textura comparables o incluso mejores que los patés producidos por fosfatos. Para este propósito, hemos preparado catorce grupos de patés donde la mezcla de fosfatos (control) se sustituyó por diferentes tipos de almidón (almidón de patata, almidón de patata instantáneo y almidón de maíz) o de harina (harina de trigo sarraceno, harina integral de trigo espelta, harina de garbanzo, harina de arroz, harina de trigo, harina de cebada con adición de betaglucano y diversas fracciones de harina de coco). Los patés de cerdo preparados fueron evaluados con los sentidos, el color fue medido por el Minolta, y los parámetros de textura fueron determinados por el analizador de textura TA.XT. Patés con diferentes tipos de almidón, harina y fosfatos ($p \leq 0,001$) fueron significativamente diferentes en la textura medida con los aparatos (firmeza, consistencia, coherencia, y el índice de viscosidad), y todos los valores de color y características sensoriales (apariencia, textura, olor y sabor) . El paté con fosfatos y el paté con almidón de maíz eran similares en calidad sensorial general. Debido a sus propiedades atractivas, el paté con harina de coco también fue interesante 140.

Palabras claves: *productos cárnicos, patés, fosfatos, almidón, harina, parámetros de textura*

Ottimizzazione dei parametri di texture del pâté di carne suina con l'aggiunta di differenti tipi di amido e farina

SUNTO

Obiettivo di questo studio è stato quello di produrre un pâté di carne suina aggiungendovi alcuni surrogati che avessero proprietà di texture comparabili o persino migliori rispetto ai pâté prodotti con i fosfati. A questo fine, abbiamo predisposto quattordici gruppi di pâté nei quali il mix di fosfati (controllo) è stato sostituito con differenti tipi di amido (fecola di patate, fecola di patate solubile e amido di mais) e farina (farina di grano saraceno, farina integrale di farro, farina di ceci, farina di riso, farina di frumento, farina d'orzo con l'aggiunta dei beta-glucani e varie frazioni della farina di cocco). I pâté di carne suina così preparati sono stati sottoposti ad analisi organolettica, il loro colore è stato misurato con Minolta, mentre i parametri di texture sono stati accertati con l'Analizzatore di texture TA.XT. I pâté con differenti tipi di amido, farina e fosfati ($P \leq 0,001$) sono risultati molto diversi sia all'esame strumentale della texture (sodezza, consistenza, legame e indice di viscosità), sia all'esame del colore, sia all'esame organolettico (aspetto, texture, odore e aroma). Il pâté con i fosfati e il pâté con l'amido di mais sono risultati i più simili quanto a qualità sensoriali. Per le sue attraenti proprietà, ha suscitato interesse anche il pâté con la farina di cocco 140.

Parole chiave: *prodotti della carne, pâté, fosfati, amido, farina, parametri di texture*

2. hrvatska konferencija o procjeni rizika porijeklom iz hrane uz obilježavanje Svjetskog dana hrane

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Konferencija će se održati 16. i 17. listopada 2017. godine na Poljoprivrednom fakultetu u Osijeku. U sklopu konferencije održat će se i nacionalno obilježavanje Svjetskog dana hrane 2017., koje HAH već tradicionalno organizira u suradnji s Organizacijom za hranu i poljoprivredu Ujedinjenih naroda (FAO).

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