

The influence of meat tissue substitution in scalded sausages by textured soy protein product on the amount of crude protein and the level of amino acids in final product

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The influence of meat tissue substitution by textured soy protein /TSP/ - Supro 50A, Ralston Purina Co.¹ - on the amount of crude protein and selected amino acids in two sorts of scalded sausages manufactured in industrial conditions and scale i.e. mortadela and in domestic middle chopped sausages were studied. The level of substitution of the animal origin of raw material in sausage mince composition was 24% and 14% respectively. Control sausages i.e. without TSP substitute were processed simultaneously. Crude protein and amino acids were determined in sausage emulsion and/or mince, in ready product and in TSP.

The obtained results do not show any significant difference in crude protein content between sausages manufactured with or without TSP. It has been found that meat tissue substitute is responsible for slight decrease of the content of selected essential amino acids in ready product i.e.: lysine, threonine and valine as well as nonessential one - glycine, histidine and proline. It was also observed that the amount of some amino acids was greater in sausages processed with TSP in comparison to the control ones, namely: isoleucine, phenylalanine tyrosine, arginine, serine, glutamic and asparagine acids. The above mentioned differences in selected amino acids content in sausages depends on quantitative amino acids composition of the protein in substitute used as a component of sausage emulsion or mince.

Einfluss der Substitution von Fleischfasern durch strukturierter Sojweißpräparat in Brühwürsten auf den Gehalt des allgemeinen Eiweisses und das Aminosäureniveau im Fertigprodukt.

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Untersucht wurde der Einfluss der Substitution von Fleischfasern durch texturiertes Sojaweiß /Supro 50A, Ralston Purina Co./ auf den allgemeinen Eiweiß - und Aminosäurengehalt in zwei industriell produzierten Brühwurstarten, d.h. in der Mortadela und in einer mittelzerkleinerten Wurstart, der Litewska. Der Austausch des Fleischrohstoffes durch Substitutions-weiß betrug in der Rezeptzusammenstellung der Wurstwaren dementsprechend 24% und 14%. Parallel wurden Konträlwurstwaren, d.h. nur aus Fleischrohstoff hergestellt. Der Gehalt an allgemeinem Eiweiß und Aminosäuren wurde im Wurstbrat, im Fertigprodukt und im Substitut bezeichnet. Die Untersuchungsergebnisse wiesen im Gehalt an allgemeinem Eiweiß unter den Wurstvarianten keine wesentlichen Unterschiede auf. Es wurde festgestellt, dass das Austausch-weiß im Fertigprodukt eine unwesentliche Niveausenkung einiger exogener Aminosäuren bewirkt u.a. des Lisins, threonins und Valins, wie auch endogener - des Glycins, Histidins, und Prolins und auch einen Gehaltsanstieg an Isoleucin, Phenylalanin, Thyrosin, Arginin, Serin, Glutamin- und Asparaginsäure beeinflusst. Die obigen Veränderungen in der Aminosäurenzusammensetzung der untersuchten Wurstwaren beeinflusst der quantitative Anteil der einzelnen Aminosäuren im strukturierten Sojweißpräparat, das als Substitut für Fleischrohstoffe in die Rezeptzusammensetzung der Würste eingeführt wurde.

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Influence de la substitution du tissu musculaire dans des charcuteries échaudees par le produit de la texture de la protéine de soya sur le contenu de la protéine générale et sur le niveau des amino-acides dans le produit tout fait.

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On a analysé l'influence de la substitution du tissu musculaire de la texture de la protéine de soya /Supro 50A, Ralston Purina Co./ sur le contenu général de la protéine et sur les amino-acides dans deux sortes de charcuteries échaudees produites dans les conditions industrielles c.-à-d "mortadela" et dans le saucisson moyennement émincé /"litewska"/. L'échange de la matière de viande dans la composition de la recette des charcuteries par la protéine de la substitution était de 24% et 14%. Parallèlement on a produit des charcuteries de contrôles, c.-à-d seulement de la viande. On a marqué dans le produit tout fait et dans la substitution le contenu de la protéine générale et des amino-acides dans la farce de la charcuterie. Les résultats des analyses n'ont pas montré de différences essentielles dans le contenu de la protéine de la substitution provoquées un petit baissement du niveau des certains amino-acides des exogènes dans les produits tout fait entre autres: lysine, threonine, valine et aussi des endogènes - glycine, histidine, proline et aussi l'augmentation du contenu: izoleucine, phényloalanine, tyrosine, arginine, sérine, de l'acide glutamique et asparagique. La quantité des amino-acides particuliers dans la protéine de la substitution introduite en échange du produit de la viande dans la composition de la recette des charcuteries influe sur les changements de la composition des amino-acides des charcuteries analysées.

Влияние введения в состав фарша вареных колбас текстурированного соевого заменителя мяса на содержание общего белка и аминокислот в готовом продукте

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Исследовано влияние замещения мышечной ткани в сырьевом составе вареных колбас текстурированным соевым белком /Супро 50A, Ральстон Пурина Ком./ на содержание общего белка и аминокислот в двух сортах вареных колбас выработанных в промышленных условиях и масштабах то есть в мортаделе и в среднерубленной колбасе локального типа. Замещение мяса белковым заменителем было соответственно на уровне 24% и 14%. Одновременно вырабатывались контрольные колбасы без белкового заменителя. По содержанию общего белка опытные и контрольные колбасы не отличались. Содержание общего белка и аминокислот определено в: фарше, готовых колбасах и в белковом заменителе. Введение соевого текстурата в сырьевой состав колбас вызывает несущественное снижение уровня некоторых незаменимых аминокислот в готовом продукте а именно: лизина, треонина и валина а также заменимых - глицина, гистидина, пролина. Одновременно увеличивается количество таких аминокислот как: изолейцин, фенилаланин, тирозин, аргинин, серин, глутаминовой и аспарагиновой кислот. На наблюдаемые изменения в аминокислотном составе исследуемых колбас влияет качественный уровень отдельных аминокислот в белке заменителя введенного в место сырья животного происхождения в рецептурный состав колбасы.

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Any products used as a meat tissue protein substitute should be nutritionally comparable to meat. Several studies have shown that soy protein preparates and among their many varieties also texturized /extruded/ does not significantly degrade, from nutrition point of view, meat products processed with addition of them and/or used as substitute of meat in recepe of a given ready products. / 1 - 8 /.

Amino acids composition of soy protein meat extenders are commonly considered as one of factor influencing it nutrition value as well as effecting nutrition quality of processed meat products manufactured with technologically acceptable levels of substitution of the meat. The present study aimed at establishing the influence of meat substitution by textured soy protein on the amount of crude protein contents and amino acids composition of two sorts of scalded sausages.

Material and methods.

Two sorts of sausages - one emulsion type and the other middle chopped i.e. Mortadella and "Litewska" was processed in production conditions and in usual way. Appart of using plant protein substitute other sorts of meat extenders was integral parts of the sausages recepes. The levels of meat substitution by texturized soy protein preparate /Supro 50A, Ralston Purina Co./ amounted to 14% in "Litewska" sausage and 24% in Mortadella.

Simultaneuosly, control sausages without plant protein addition was processed with increased quantity of meat tissue correspondingly to the amount of hydrated 1 : 2,5 textured soy protein preparate. The main raw materials composition of the two investigated sausages excluding: water, cure salts, spices and seasonings was following:

<u>"Litewska" sausage</u>		<u>Mortadella</u>	
1.Pork meat class II	15%	1.Pork meat class IV	5%
2.Beef /lean/	15%	2.Beef /lean/	30%
3.Beef class III	10%	3.Pork jowls	19%
4.Beef class IV	30%	4.Mechanically deboned meat	12%
5.Pork jowl	5%	5.Fat-collagen emulsion	5%
6.Fat-collagen emulsion	5%	6.Blood plasma	5%
7.Mechanically deboned meat	6%	7.SPS Supro 50A /hydrated/	24%
8.SPS Supro 50A /hydrated/	14%		

Total protein contents and amino acids composition was determined in sausages 24 hours after completing of the processing i.e. in a ready products. Three separate lots of control and experimental sausages was manufactured. All analysis was made in triplicate. Total protein content was determined by Kieldahl method /N x 6.25/ and amino acids composition after hydrolysis 0.5 - 1.0 gm sample in glass ampule with 6N HCl solution at 110°C ± 2°C during 24 hours using automatic amino acids analyser, Microtechnica - Praha, type AAA 881. Total protein contents and amino acids composition was also determined in Supro 50A - soy protein preparate.

Results and discussion

According our findings substitution of meat tissue by soy protein preparate does not effects total protein contents in a ready products. Content of crude protein in mortadella processed without and with substitute was 12.18% ± 0.7% and 12.51% ± 0.4% respectively and in "Litewska"

sausages $12.75\% \pm 0.4\%$ and $12.58\% \pm 0.5\%$ respectively. The difference in crude protein content between sausages processed with and without meat substitution was found statistically insignificant.

The amino acids spectrum as shown in Table 1 and Fig. 1 and 2 of the two sorts of investigated sausages processed without meat substitution did not differ significantly, although the difference in contents of selected amino acids was observed. For example higher content of valine and glutaminic acid was determined in "Litewska" sausage. Amino acids composition of the raw materials protein used as components of their recipe are most probably responsible for observed differences in levels of selected amino acids of the ready products.

A comparison of the amino acids contents of sausages processed without and with substitution of meat in their recipe by SPS demonstrates that the levels of some amino acids are substantially influenced by soy textured protein preparate used as meat tissue substitute. These refers mainly to Mortadella i.e. sausage processed with relatively very high level of meat substitution, namely 24%. As it could be seen from the results in Table 1, using SPS as a component of the Mortadella recipe decreased, statistically significantly, the following essential amino acids: lysine, threonine and methionine as well as nonessential amino acids such as histidine, proline and glycine. Simultaneously, the amounts of selected amino acids in Mortadella processed with SPS are increased statistically very significantly. These concerns the following ones: isoleucine, phenylalanine, arginine, serine, alanine, thyrosine, asparagine and glutaminic acids. Therefore it seems doubtless that increase, mainly of the nonessential amino acids, although also such essential like isoleucine and phenylalanine is influenced by the very high level of meat substitution by soy protein preparate as a component of the recipe of Mortadella. The amino acids spectrums in "Litewska" sausage processed with 14% substitution of meat raw materials by SPS are much less influenced by used protein preparate. However also this sort of investigated sausage show difference in the levels of selected amino acids, although less statistically significant apart of glutaminic acid and thyrosine. Substitution of meat by SPS in the recipe of "Litewska" sausage decrease the levels of threonine and valine as well as alanine, glycine, proline but increase: methionine, isoleucine, phenylalanine, arginine, tyrosine and asparagine and glutaminic acids.

On the base of our findings it should be released that from nutrition point of view substitution of meat by any sort of extenders but mainly by plant origin will effect the amino acids composition of the given ready products. The only question is to which extend substitution will effects - significantly from nutrition point of view or not.

Bearing in mind that meat industry processes numerous sorts of different products which even in one country differ very much in the recipe components of these some product sorts and which also are subject of quite frequent changes - evaluation of amino acids composition of each sort seem impossible. Therefore only general conclusions with regard to influence of meat substitution by soy protein substitute on amino acids pattern of the given type of meat products are of interest to processors and consumers.

Conclusions.

1. The amino acids composition of two sorts of investigated sausages are influenced by plant origin texturized protein substitute and observed differences are statistically significant.
2. Differences involved both essential and nonessential amino acids.

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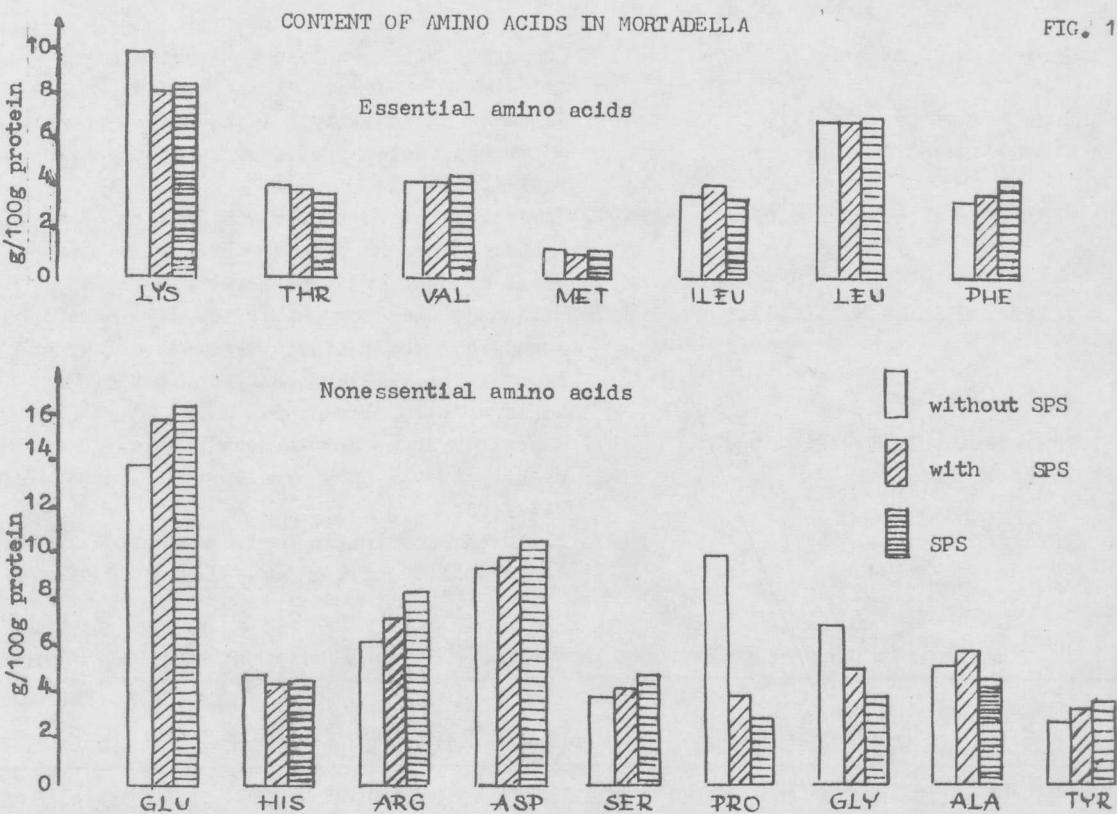
TABLE 1.

Amino acid content in sausages processed with and without SPS /g/100g/protein/

	MORTADELLA				"LITEWSKA"			
	Amino acids	Without SPS	With SPS	t.calcd.	Without SPS	With SPS	t.calcd.	SPS
Essential	Lis	9.77 ± 0.10	8.13 ± 0.10	28.916 ^{XXX}	9.24 ± 0.07	9.16 ± 0.34	0.563-	8.36 ± 0.03
	Tre	4.06 ± 0.08	3.81 ± 0.07	5.661 ^{XX}	3.94 ± 0.24	3.50 ± 0.13	3.928 ^X	3.54 ± 0.12
	Val	4.23 ± 0.33	4.19 ± 0.09	0.283-	5.49 ± 0.13	5.07 ± 0.21	4.253 ^X	4.45 ± 0.45
	Met	1.18 ± 0.03	1.11 ± 0.03	4.159 ^X	0.92 ± 0.09	1.06 ± 0.05	3.226 ^X	1.20 ± 0.02
	Ileu	3.52 ± 0.07	4.01 ± 0.04	13.768 ^{XXX}	3.62 ± 0.29	4.00 ± 0.03	3.132 ^X	3.53 ± 0.17
	Leu	6.79 ± 0.03	6.77 ± 0.04	0.902-	6.25 ± 0.26	6.40 ± 0.13	1.270-	6.89 ± 0.08
	Phe	3.31 ± 0.07	3.72 ± 0.09	8.534 ^{XX}	3.54 ± 0.29	4.02 ± 0.13	3.712 ^X	4.29 ± 0.15
	Σ	32.86	31.74		33.00	33.21		32.26
Nonessential	His	4.72 ± 0.06	4.37 ± 0.05	10.435 ^{XXX}	4.57 ± 0.35	4.53 ± 0.05	0.276-	4.46 ± 0.09
	Arg	6.20 ± 0.03	7.17 ± 0.06	34.646 ^{XXX}	6.27 ± 0.10	6.99 ± 0.43	3.947 ^X	8.39 ± 0.21
	Asp	9.38 ± 0.04	9.74 ± 0.09	9.000 ^{XXX}	8.81 ± 0.35	8.99 ± 0.64	6.032 ^{XX}	10.60 ± 0.23
	Ser	3.85 ± 0.08	4.12 ± 0.18	3.311 ^X	3.55 ± 0.28	3.61 ± 0.46	0.272-	4.81 ± 0.12
	Glu	13.85 ± 0.34	15.86 ± 0.37	9.783 ^{XXX}	14.96 ± 0.28	16.28 ± 0.10	10.869 ^{XXX}	16.30 ± 0.29
	Pro	3.91 ± 0.02	2.88 ± 0.05	47.260 ^{XXX}	4.15 ± 0.12	2.96 ± 0.44	6.361 ^{XX}	2.85 ± 0.09
	Gli	6.91 ± 0.04	5.04 ± 0.10	40.889 ^{XXX}	5.79 ± 0.15	5.20 ± 0.22	5.343 ^{XX}	3.80 ± 0.06
	Ala	5.20 ± 0.14	5.78 ± 0.08	8.760 ^{XXX}	5.76 ± 0.10	5.21 ± 0.27	4.705 ^{XX}	4.56 ± 0.13
	Tyr	2.85 ± 0.05	3.43 ± 0.01	26.851 ^{XXX}	2.74 ± 0.05	3.35 ± 0.12	11.168 ^{XXX}	3.56 ± 0.12
	Σ	62.87	58.39		56.60	57.12		59.33
	Σ	95.73	90.13		89.60	90.33		91.59
	<small>XXX = α ≤ 0.001</small>	<small>XX = α ≤ 0.01</small>					<small>x = α ≤ 0.05</small>	<small>- = n.s.</small>

CONTENT OF AMINO ACIDS IN MORTADELLA

FIG. 1.



CONTENT OF AMINO ACIDS IN "LITEWSKA" SAUSAGE

FIG. 2.

