

UTILIZATION OF PEAS PROTEIN PREPARATE IN SAUSAGE PRODUCTION

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Peas protein prepare was obtained after extraction of nitrogen substances in alkaline solution from peas meal. An insoluble substances were separated and solution after neutralization was concentrated and dried as by drum drying. Prepare contained about 65% protein in dry matter, about 1% fat, and about 10% ash. The regain of nitrogen substances was about 75%.

Prepare showed good sensoric characteristics, low viscosity, high absorbtion of fat and water and rather high nutrition value /higher than soya protein isolate/. Peas protein prepare was utilized as substitute for meat protein in production of frankfurter type of sausages. It was used in 2 - 7% instead of other prepares /sodium caseinate or soya protein isolate/ and part of ground meat.

According to the obtained results peas protein prepare can be used in production of frankfurter type of sausages in double amount than the normally used substitutes /sodium caseinate or soya protein isolates/ without lowering the eating quality of final products.

L'UTILISATION DE LA PRÉPARATION PROTÉIQUE DU POIS DANS LA PRODUCTION DES SAUCISSONS

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La préparation de protéine du pois a été obtenue par l'extraction des matières azotées dans le milieu alcalin de la farine de pois. Les parties insolubles ont été séparées par centrifugation et la solution après la neutralisation a été concentrée et on l'a séchée dans les appareils cylindriques. La préparation contenait environ 65% de protéine en matière sèche, env. 1% de graisse et env. 10% de cendre. La récupération des matières azotées comprenait env. 75%.

La préparation montrait de bonnes caractéristiques sensorielles, une petite viscosité, une bonne absorption de graisse et d'eau ainsi qu'une grande valeur nutritive /plus grande que l'extrait de protéine du soja/. La préparation de la protéine du pois a été utilisée comme un produit remplaçable de la protéine de viande dans la production des saucissons, type frankfurter. On l'a utilisé en quantité de 2% à 7%, en remplaçant de telle façon d'autres préparations /caséine du sodium ou l'extrait de protéine du soja/ et une partie de la farce de viande.

On a constaté que la préparation de protéine du pois peut être utilisée dans la production des saucissons, type frankfurter, en quantité deux fois plus grande que les substituts généralement utilisés /caséine du sodium, l'extrait de protéine du soja/, sans abaisser la qualité de consommation des produits.

ANWENDUNG VON EIWEISSPRÄPARATEN AUS ERBSEN ZUR WURSTWARENPRODUKTION

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Das Eiweisspräparat wurde aus Erbsenmehl durch Extraktion der Stickstoffsubstanz im alkalischen Milieu erhalten. Unlösliche Teile wurden durch Zentrifugieren entfernt, die Lösung durch Neutralisation konzentriert und in Walzentrocknern getrocknet. Das Präparat enthielt etwa 65% Eiweiss in Trockenmasse, etwa 1% Fett und etwa 10% Asche. Die Ausbeute an Stickstoffsubstanz betrug etwa 75%.

Das Präparat zeigte gute sensorische Eigenschaften, niedrige Viskosität, hohe Fett- und Wasseraufnahmefähigkeit sowie einen relativ hohen Nährwert /höher als Soja-Eiweissisolat/. Das Erbsenprotein wurde als Fleischiweiss-Substitut zur Produktion von Brühwurst verwendet. In Mengen von 2 bis 7% ersetzt es andere Eiweisspräparate /Soja- und Milchproteine/ sowie einen Teil des Fleischbrätes.

Es wurde festgestellt, dass das Erbsenprotein zur Brühwurstherstellung in doppelter Menge als allgemein angewandte Substitute /Soja- und Milchproteine/ verwendet werden kann, ohne die Verbrauchseigenschaften der Produkte zu vermindern.

ИСПОЛЬЗОВАНИЕ БЕЛКА ГОРОХА В ПРОИЗВОДСТВЕ КОЛБАС

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Белковый препарат гороха был получен путём экстракции азотных веществ в щелочной среде из гороховой муки. Нерастворимые части отделяли путём центрифугирования, а раствор после нейтрализации был концентрирован и подвергался сушке в вальцовой сушилке. Препарат содержал приблизительно : 65% белка сухого вещества, 1% жира и 10% золы. Выход азотных веществ составлял приблизительно 75% .

Препарат отличался хорошими органолептическими свойствами, высокой абсорбцией жира и воды, а также относительно высокой питательной ценностью /более высокой, чем белковый препарат из сои/. Белковый препарат гороха был использован как заменитель белка мяса в производстве вареных колбас. Он применялся в размере 2 - 7% при чём он заменял другие препараты /белок молока или сои/ и также часть мясного фарша.

Установлено, что белковой препарат гороха может быть использован в производстве вареных колбас в количестве в два раза больше чем обычно используемые субституты /белки молока или сои/ без обнижения потребительного качества продуктов.

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INTRODUCTION

Since several years protein preparates have been used in food industry, particularly as substitutes for meat. The basic raw material for obtaining these preparates is the soybean. From among others raw materials the peas are ever more appreciated. A realistic outlook for this raw material is provided by the growing of high-protein varieties, the protein yield of which per hectare amounts to 330 kg /Swięcicki 1975/. Moreover, nutrition experts have no reservation as to peas, and the content of trypsin inhibitor is lesser than in soybeans. The advantage of peas, from the technological point of view, is a low content of fat in seeds, which allows to leave out in the process of obtaining the prepare the technically inconvenient stage of fat extraction from seeds by means of high-purity hexan.

MATERIALS AND METHODS

For obtaining protein preparates there were used the seeds of Polish trade pea, Victoria which contained up to 25% of protein /Nx=,25/ in dry matter, and the Ranger cultivation variety /about 33% of protein in dry matter/. The obtained protein peas preparates were compared with the isolate of soybean protein Promino D /about 95% of protein in dry matter/ and with the sodium caseinate /about 89% of protein in dry matter/.

The adaptation of typical technological solutions used for soybean, such as the concentration or isolation method in obtaining protein preparates from peas is economically unjustified because of low content of carbohydrates soluble in water /Taupel et al.1960/, a different solubility of proteins and a lower content of protein in the raw material. Besides, in obtaining of protein preparates, particularly by the isolation method, there occur considerable losses of nitrogen substances /about 45%/. On the other hand, in obtaining protein preparates from peas good effects were achieved by applying the method based on the Young and Craig concept /1974/, which consists in the extraction of nitrogen substances in an alkaline solution. After the extraction, the insoluble parts are separated, and the solution, after neutralization and concentration, is dried /without previous protein precipitation, see scheme No.1/.

The technological usability of preparates thus obtained for the meat processing industry was studied by using them as protein substitutes in the production of sausages /polish and frankfurter types/. Three test productions of sausages /in micratechnical scale/ were carried out, with applying the following additives of protein preparates from peas meal: for the polish type sausage - 2%, 3%, 4% and 6%, for the frankfurter type sausage - 3%, 5% and 7%. For the test sausage there were used soy protein or milk isolates in the amounts provided by national recipes /for the polish type sausage 2%, and for frankfurter type sausage 3% /. In case of adding to pork-butcher's meat a larger amount of substitutes than provided by norms, an adequate amount of beef was removed. The preparates were added to the stuffing during cutting /at the very beginning of the process/. For all, the same amount and the same kind of seasoning and water was used.

RESULTS AND DISCUSSION

The protein content in the obtained preparates, called semi-isolates, amounted to 60-65%

in dry matter, depending on the peas variety applied. According to the approved nomenclature, it suits the group of concentrates /preparates containing 65-75% of protein - Schmidt 1974/. The remaining part of the semi-isolate dry substance consisted of insoluble carbohydrates, mineral salts and other substances soluble in the extraction process. The presence of this non-protein part /mainly sugars/, according to Baryko-Pikielna/1975/ favourably influences the functional and sensoric characteristics. The obtained preparate /in microtechnical scale/, with the extraction efficiency of 75%, was marked by comparatively favourable functional features, such as low viscosity, high absorption of fat and water, as well as by organoleptic and nutritive features /see Table 1/, when compared with the isolates of soy protein. Worth noting is the high ability for fat absorption of the obtained preparate, which eliminates the leakage of fat under the casing. The aim of comparing the characteristics and the usefulness of the protein preparate from peas with the soybean isolates was to check the possibilities of substituting them. It was an indirect comparison since the preparates under study differ in their composition and character. Therefore, the chemical composition of sausages obtained with the same share of substitutes shows a lower protein content in the products with the semi-isolate of peas protein added. The yield of the final product was on the same level for all sausage samples and proved a high ability of the semi-isolate to retain water. It was found, on the ground of the sensoric evaluation of the preparate and of products with the preparate added, that the sensoric features of the preparate can be considerably improved by applying drum drying instead of the spray-drying method. It probably results from applying higher temperatures during drum drying. Under these circumstances, a part of compounds accounting for the specific pea flavour evaporates, and a part makes inactive compounds. This explains evident preference, in sensoric evaluation, for products with protein semi-isolate from peas added /see Table 3/.

CONCLUSIONS

1. The obtaining of preparates from peas by the method of incomplete isolation allows to get a product of a comparatively high content of protein /about 65%/ with a high regain of nitrogen substances /about 75%/.
2. The method of drying essentially influences the sensoric characteristics of the semi-isolate.
3. The protein semi-isolate from peas, containing about 60-65% of protein in dry matter, can be used as a substitute for meat protein.
4. Owing to favourable sensoric characteristics, obtained without using harmful chemical means, the protein preparate from peas, dried by drum method, can be added to sausage /polish and frankfurter type/ in twice as high quantities as the substitutes used now, without lowering the quality of final products.

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Scheme No.1. Proposed technology for obtaining of the protein semi-isolates from peas

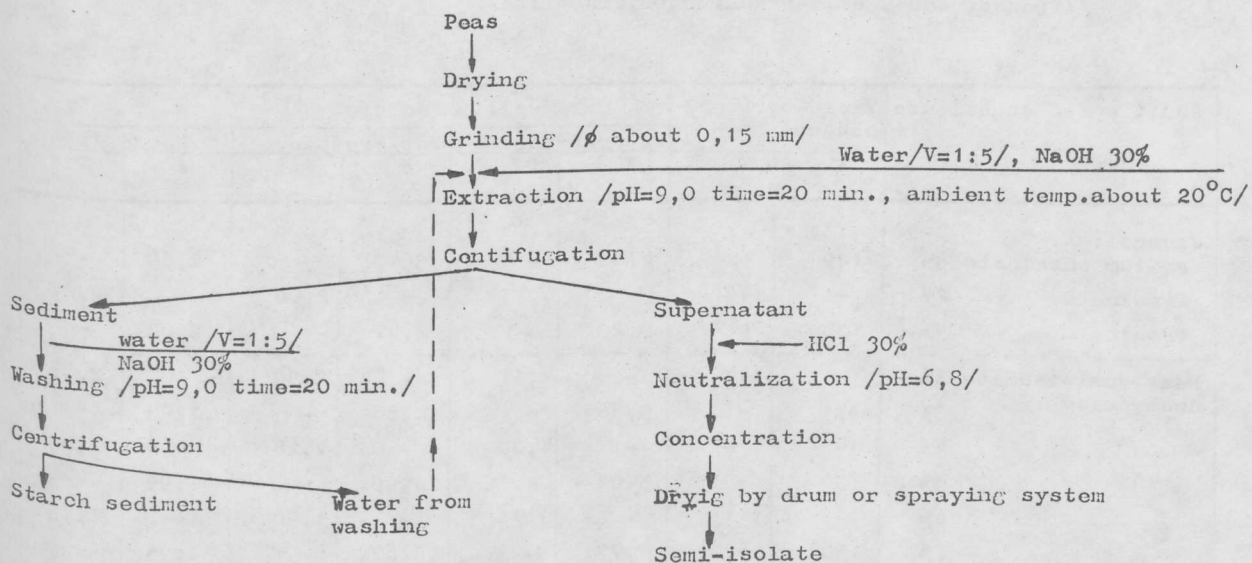


Table 1. Physical properties of protein semi-isolates from peas and Promine D

Kind of preparate	Water holding capacity g/g d.m.	Capacity for fat absorption on %	Viscosity cP	Emulsifying capacity V ml Oil /100mg protein	pH of 10% solution	NSI	NPU
Protein semi-isolate obtained by drum-drying	2,3	-	5,1	29,5	6,4	90,9	50,7
Protein semi-isolate obtained by spray-drying	2,8	264	6,1	22,8	6,6	57,4	50,1
Promine D	5,0	100	26,9	50,0	6,8	84,0	40,2

Table 2. Chemical composition of sausages containing an addition of peas semi-isolate /types of sausage: F-frankfurter, P-polish/

Addition of substitute	Yield of final product %		Quality factors					
	F	P	Water/Protein		Fat/Protein		NaCl	
			F	P	F	P	F	P
Control: sodium caseinate 3%	129	-	4,86	-	3,40	-	2,89	-
Promine D 2%	-	114	-	4,51	-	2,06	-	2,28
Promine D 3%	130	-	5,23	-	2,47	-	2,02	-
Peas semi-isolate drum-dried 2%	-	114	-	4,17	-	2,33	-	2,48
3%	131	-	5,86	-	2,86	-	1,93	-
4%	-	114	-	4,00	-	2,28	-	2,63
5%	130	-	5,04	-	2,96	-	1,99	-
6%	-	111	-	3,75	-	1,90	-	2,93
7%	130	-	4,77	-	3,67	-	2,95	-
Peas semi-isolate spray-dried 3%	136	-	6,28	-	4,44	-	2,28	-

Table 3. Results of the sensoric evaluation

Sau sage	Kind of sample	Addition of prepa rates %	Color	Taste	Consis tence	Flavour	Total ^x score
pol- ish type	control	2	3,5	2,4	2,3	3,3	2,5
	with add.of semi- isolate	2	3,5	2,4	2,8	3,5	2,9
	with add.of semi- isolate	4	3,1	3,1	3,0	3,5	3,2
fra- nkfu- rter type	control /sodium casei- nate/	3	3,5	3,1	3,4	3,5	3,2
	control /Promine D/	3	3,7	2,7	3,3	3,3	-
	with add.of semi- isolate	3	3,6	2,8	3,5	3,5	2,7
	with add.of semi- isolate	5	3,5	2,9	3,4	3,5	3,1
	with add.of semi- isolate	7	3,2	2,8	3,4	3,5	2,9

x - Total score is not an average of the individual results