Chemical-Nutritional Physiological Evaluation of a Few Products Manufactured with the Use of Soy Protein

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ABSTRACT

A number of Hungarian foods containing soy products is described. Institute studies on new protein sources also are discussed.

INTRODUCTION

Our Institute has been given the project of investigating all new protein sources directly suitable for human consumption within the framework of a country-wide program. As part of the investigation of new protein sources, processing and technology are of great significance, since these determine the character of the products which can go into traditional food industry products. The research extends to fortification of existing foods, i.e. to the increase of protein content. On the one hand, the added proteins play a role in the substitution of animal proteins; and on the other hand, they improve consistency, enhance color, and increase water and fat binding properties.

Protein sources possibly suitable for direct human consumption are slaughterhouse and dairy industry by-products of animal origin, blood, and blood plasma, as well as the caseinates manufactured from skim milk and whey. Furthermore, the so called biomasses of yeast, mold, and fungi protein, oilseed protein from soybeans and cottonseed, and native products from sunflower and rapeseed are large available protein sources.

Various concentrated proteins are available from soybeans on a large scale. The amino acid pattern of the protein concentrate and isolate manufactured from soybeans, for the most part, comes close to the amino acid pattern of animal protein.

INSTITUTE STUDIES ON MEAT ANALOGUES

In our Institute we have studied a few meat analogues from soy protein bases supplied by an American firm, which were manufactured with the addition of colorants and spices, as well as fat and water. These products have been compared on the basis of chemical studies and studies referring to the nutrient value with natural beef, pork, and chicken, as well as with pressed ham.

Without discussing the research methods in detail, we determined the raw protein, fat, and water contents of the samples and controls with chemical methods. Table I shows the results of these studies. The protein content of natural and artificial meats is converted into ca. the same calculated value.

We have quantitatively determined the amino acid pattern of the samples with an automatic analyzer. Beef and pork have exceeded the average of all other samples in the essential amino acid content. The two imitation hams were scarcely different.

We carried out sample digestion with pepsin-pancreatin treatment, which is the method generally used nowadays. We have simplified and adapted the detailed treatment. In the artificial meats studied, at least 92% of the protein content is digested.

We have studied the biological value of the protein present in the samples with microbiological methods—with *Tetrahymena* test organisms. The protein value of three soybean products studied was surprisingly good—89%, 92%, and 99% respectively.

From our studies, it can be shown that the products with a soybean base can be related in composition and nutrient value equivalent to natural meat products. They are even more suitable for the manufacture of certain desired products since one can standardize their composition in regard to protein, calories, and vitamin content.

On the basis of information already available, I shall give a brief report about our studies aimed at increasing the protein and nutritive biological value of a few native products.

The introduction of new food products to take advantage of the increased nutritive value of the additives is fastest in institutional supply and child feeding. In cooperation with the Chair for Institutional Science of the Institutional and Hotel School, soups and pastas fortified with protein and soy, prepared in various ways corresponding to Hungarian food customs, are being manufactured, like soy-energy soup, gravies thickened with rolled oats, imitation ground meat made from soy grits, linzers fortified with soy, biscuits, flammenkuchen, and folded salty tea pastries fortified with soy or caseinate. To parallel this, for the most part, the traditional assorted dishes are prepared for controls.

SUBSTANCES USED FOR SUPPLEMENTING AND PUBLICATION OF THE PRODUCTS THUS OBTAINED

For supplementation, we have used soybean flour of native roasting and milling, with the designation "sweet industrial soy"; promine D from Central Soya and promosoy 100; products of the French firm, Oleagineaux, Soyasim; the E.M. HV caseinate of the Dutch firm DNV; and a few yeast-baked products fried in fat.

The protein values of the traditional grammel and folded puff pastry products were fortified with soy protein and yeast-soy protein combinations to increase the protein contents by 50-170%. The fat content of ca. 30% remains high to be sure; however, the character of the sample corresponds to the traditional consistency. Decrease of the

TABLE I

Composition of Natural and Simulated Meat-like Products[a]

Product	Protein	Fat	Water	Dry substance
Simulated products				
Beef-like	18.3	8.9	68.1	31.9
Luncheon loaf	19.6	13.6	55.3	44.7
Chicken-like	19.8	13.9	60.0	40.0
Meatless chicken-style	20.0	18.3	52.8	47.2
Mincemeat	20.3	3.1	60.1	39.9
Sausage	20.9	13.2	54.8	45.2
Ham flav. dices	21.2	9.4	59.4	40.6
Ham-like	22.2	8.7	59.9	41.1
Chicken flav. dices	23.5	b	59.3	40.7
Ham-style loaf	24.5	10.3	51.3	48.7
Natural meats				
Pressed ham	19.9	5.3	71.1	28.9
Pork sausage	20.8	8.3	70.2	29.8
Beef roast	23.3	1.4	72.8	27.2
Chicken breast	24.0	0.5	73.2	26.8

[a]Given in percentage.

[b]Insufficient data.

caloric content was not our aim.

In the pastries produced in the operation of the hotel school, the fat content of the linzers and the folded salty tea cakes is likewise high; but, to be sure, it is advantageous that one mixes his dough with vegetable fat, margarine. The flammenkuchen yeast rolls are fried in edible oil. With this product we have increased the 5.3-8.5% protein content of the control with fortification to 11.2-12.1% without taste degradation.

In the linzer products, the protein content is 2.8 times that in the control. We determined the amino acid composition of protein in the pastries and found that the products supplemented with protein addition, excluding two exceptions (histidine in one sample and glutamic acid in another) contained more of the total amino acids than the controls. Also digestibility tests show that the digestible protein content of the products increases after supplementation.

From our studies it is clearly evident that soy protein can be used in large quantities to increase the protein content and nutritive biological value of the traditional products. It is, however, also to be concluded that the combined use of proteins of animal, plant, and microbiological origin (the so called biomasses) suitable for supplementation is becoming profitable in the foods and are successful products of our food industry.