Manufacturing and Marketing of Soy Products for Human Consumption in Mexico[1]

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ABSTRACT

The following items are discussed: (A) the importance of distributing products that can be consumed directly or formulating fortified products for daily use without producing physical or flavor changes in the product; (B) ways of popularizing the acceptance of soy products through demonstration, promotion, and publicity; (C) commercial presentation of the product, cost, and keeping quality; and (D) distribution.

INTRODUCTION

Numerous nutritional studies made in Mexico have shown that 31% of children in rural areas and 16% in urban areas are in a state of second and third degree malnutrition and require medical attention (1-3).

Infant nutrition is basic for health; health is basic for development. Adequate feeding during the first 3 years of life is vital for the physical and mental development of the human being. Insufficient feeding in quality and quantity during these first years will bring immediate consequences to the intellectual capacity, producing irreversible brain lesions (4,5).

In Mexico every year, ca. 2 million children are born, of which 300,000 die before they reach the age of 5 due to problems related to the malnutrition-illness cycle (6).

If the birth rate in Mexico continues to rise, the population will be more than double by the end of the century. The key questions are: how can we actually supply food to thousands of beings that are born every day and will that food be adequate?

NEW PROTEIN SOURCES

It is true that agricultural productivity is increasing every year, but it is also true that population increases at a more rapid rate. Of all nutritive elements we consume, such as fat, proteins, minerals, and vitamins, the most expensive one in our diets is protein. In the underdeveloped countries, the majority of proteins consumed is of vegetable origin with the well known deficiencies (7).

As a consequence, the majority of the Latin American, African, and Asiatic countries does not consume protein in adequate quantities nor in the quality required. One solution to this problem is to increase the production of foods that contain animal protein, but these foods are difficult to obtain, because the price is very high.

The price of milk protein, meat, and eggs in our country is above 100 pesos/kg. This prevents the more needy people from consuming sufficient quantities of these foods; therefore, it has been necessary to search for new sources of protein that are cheaper and more abundant. Oilseed flours, such as soy, sesame, peanut, cottonseed, and sunflower seed have been studied (8-10). Processes also have been studied to obtain protein from unicellular organisms and algae (11-12).

The use of vegetable proteins in human food presents some problems, such as: their high fiber content, antinutritional factors, problems related to flavor, and lack of one or more of the essential amino acids (13,14).

Of all these seeds, the one studied the most and the one that is more widely used is soy. Its consumption is very general due to the advantages it has over other seeds: high nutritive value and adaptability to diverse climates and soils, as well as its relatively easy cultivation (15,16). It is for this reason that, in this presentation, we are going to discuss only soy for extending proteins of animal origin, but we want to emphasize that other proteins of vegetable origin also can be used for these purposes.

SOY IN EXTENDING PROTEINS

Soy is not a new product, since it has been cultivated and consumed by Orientals for 4000 years (17). There is a general belief that the Chinese would not have been able to survive without this legume. The soybean was introduced into the U.S. in 1904. Today, this country produces 80% of the world production (40 million m/t) (18). Other countries which produce soy, besides the Oriental countries, are Brazil (5 million m/t) and Mexico (500,000 m/t).

Full-fat soy has the composition shown in Table I.

The primary use for soybean seed is for the extraction of oil. The residual meal basically is used in poultry and animal feeds. When the residual meal is destined for human consumption, the oil extraction process has to be done with more care. There must be more cleanliness of the seed; treatment is initiated to destroy the antitrypsin factors; and the extraction should be affected in specific conditions so as not to damage the protein (19).

After extraction, the meal is ground into flour and has the characteristics shown in Table I.

The quantity of protein does not tell us if it is of good or bad quality. To have a better idea, it is necessary to know the quantities of essential amino acids and compare them with a protein reference standard, such as the United Nations Food and Agriculture Organization protein reference standard of 1957 (Table II).

The principal deficiency is in methionine. To correct this deficiency, milk can be added to soy rations, or soy flour can be mixed with cereal grains (20). Taking into account these considerations, soy flour and its derivatives can be used in various ways to extend proteins of animal origin. We can mention the products most simple to make, such as defatted soy flour and soy grits added to eggs, meats, and milk. It is well established that one may use soy flour to extend egg protein in the baking industry. Soy flour and soy grits are used widely to extend meats.

The main use of soy flour and soy grits is for mixing with cereals to improve the quantity and quality of protein. The quantity of protein is raised, because the products of defatted soy contain more protein than do the cereal products, as can be seen in the Table III.

The quality of the protein is improved in the mixtures

[1]One of 13 papers presented in the symposium, "Soy Protein," at the AOCS Spring Meeting, Mexico City, April 1974.

TABLE I

Approximate Analysis of Full-Fat and Defatted Soy Flours

Content	Full-fat (%)	Defatted (%)
Proteins	43.0	50.0
Fat	20.0	1.0
Fiber	2.5	2.5
Ash	6.0	6.0
Moisture	6.0	6.5
Carbohydrates	30.0	31.0

TABLE II

Essential Amino Acids of Soy and FAO[a] Protein of 1957

Amino acid	Soy protein	FAO protein
Lysine	7.23	4.20
Isoleucine	4.70	4.20
Threonine	4.74	2.80
Valine	4.99	4.20
Triptophane	1.36	1.40
Methionine	1.34	2.20
Phenylalanine	5.30	2.80
Leucine	8.19	4.80

[a]FAO = United Nations Food and Agriculture Organization.

because soy protein is rich in lysine, the first limiting amino acid in the majority of cereals. The largest percentages of soy flour have been incorporated into white bread. The addition of up to 12% to white bread increases the lysine content to more than double and the protein content is increased by 30% (21).

Similar improvements in the nutritional value of corn and wheat have been obtained. A case in point is the well known cereal-soy mixtures (CSM) which are a mixture of corn, soy powder, nonfat milk powder, vitamins, and minerals.

Another example of a mixture fortified with soy is wheat soy blend (WSB). The USDA is allowing the use of fortified macaroni products as a nutritional alternative in the school lunch program. This decision was made to obtain a formulated mixture that has the same nutritive value as animal protein.

SOY PROCESSING IN MEXICO

Taking into account all of the foregoing, in the year 1967, we began to study the possibilities of processing soybeans for use in human foods. Certain processes were developed and patented which served as a base for creating a new technology and for forming the company, Industrial de Alimentos, S.A. Since its formation, it has been oriented toward producing food products derived from soybeans. We always intended making products that could be used in foods which our people are accustomed to eating or in developing new products. We have tried to make and package the products to fit the desires of the consuming public. Therefore, we have tried to make three basic products: (A) full-fat soy flour to be used in the preparation of protein enriched foods, such as soups, breakfast cereals, snacks, and as an extender for baking and preparation of pastas and cookies; (B) soy milk to be used as an extender of cows' milk in bread making and in the preparation of other products, such as chocolates, cookies, gruels, calf milk replacers, etc.; and (C) texturized soy protein to be used in the so called meat analogues or vegetable meats (22). These products are used in the preparation of sausages, hamburgers, meat balls, and many typical dishes, such as enchiladas, tacos, and others made with chili.

At the present time, many of these products are being used in various official institutions in the feeding of employees and in the feeding of children in boarding schools, with good results as far as acceptance is concerned. Various products are now on the market and being distributed by governmental institutions, such as Conasupo, Social Security, the Bureaucratic Union, in all the states of the Republic. Also, they are found in supermarkets and self-service stores, and we have begun selling these products through small stores.

It is necessary to do more promotion work and to educate housewives of the lower income groups to use these products, since it is always the needier people that offer the most resistence to consuming them.

TABLE III

Protein Contents of Selected Mexican Foods[a,b]

Prepared foods	Protein (%)
Corn flour for tamales	9.7
Corn flour for tortillas	7.1
Rapeseed meal	14.8
Potato flour	6.6
Soy flour	40.8
Wheat flour for bun	11.5
Wheat flour for pastry	11.1
Carrot flour	3.6
Defatted peanut flour	30.0
Wheat grain	12.9
Wheat flour	10.1
Wheat brain	14.5
Preserved white cactus fruit	4.5
Preserved red cactus fruit	4.7

[a]Content/100 g.

[b]Table by Rene O Craviato, Guillermo Massieu H., Jesús Guzman G., and Jose Calvo de la Torre, National Institute of Nutrition.

We believe that in the near future these products will be within the reach of all people of the country, and this will help resolve the grave malnutrition problem found in Mexico.

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[Received January 8, 1975]