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Soy Protein Development in Japan (Especially for Isolated Soy Protein)

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DEVELOPMENT OF SOY PROTEIN IN JAPAN YESTERDAY AND TODAY

In the beginning, apart from the foodstuffs, soy powder was used industrially as a material for dry paints and as an adhesive agent in the U.S. in the 1930's. After World War II, soy protein was regarded for its nutritious value.

Before the war the Japanese studied the soy protein in Manchuria. Among the studies they sampled textured soy protein, but World War II created a void in the development of soy protein for the Japanese.

Originally, the application of soy protein began with the introduction of the battery extraction system made in Germany at the end of the Taisho era. Before that, soybean oil had been obtained with the press machine only; and the cake, as residue, was used for fertilizer.

In the 1920's, with the introduction of the battery extraction system, the residue changed cake to meal. However, these meals also were used for fertilizer and were not usable for human food or meal for animals.

At the end of World War II, we Japanese were surprised to find that the country producing the most soybeans was not Manchuria, but the U.S.

The critical food situation after the war created a big demand for American soybeans and we Japanese imported them as relief material at first and concentrated our efforts upon their development.

Soybeans were used in making feedstuffs first. In our ancient history we had the custom of consuming soybeans directly. In Japan, miso, shoyu, natto, tofu, and uba are some of the soybean foods ued for direct consumption.

In May 1964, the International Symposium on Oil Seed Protein Food was held at Lake Yamanaka near Mt. Fuji, and Japanese soy protein products were impressive. To be frank, I was surprised. We came to regard our traditional soy protein products highly. Among the processed soybean products, we began to use soy meal in tofu as human food after the war. This development gave impetus to the further development of soy protein products in Japan. Before this discovery, the tofu was made of the soybean itself. But after this discovery, we use soy meal for tofu. Nowadays, much soy meal is used in shoyu also.

It is hard to grasp the whole picture of soy protein products in Japan now. This is because the development is at a turning point and each manufacturer develops his products confidentially. The potential use of soy products is certainly great. Moreover, in addition to soybean crushers, trading companies, marine companies, pharmaceutical companies, chemical companies, and confectionary companies are paying attention to this field and are beginning to study it.

DEVELOPMENT OF ISOLATED SOY PROTEIN IN JAPAN

The products made from soy protein products are as follows: soy powder and soy grits (fatted and defatted), soy meal (defatted), concentrated protein, textured protein, isolated protein, and spun protein.

However, I am going to talk about the isolated protein. The study of isolated soy protein in Japan has a long history, but it was only ca. 10 years ago that the product entered the market industrially. The first maker to market the isolated soy protein was Nikka Fats & Oils. At that time, I was associated with Nikka, and we were working toward market development.

The product in those days was inferior in quality, color, and odor. There was no education of the customers to accept the new product at all, and we often heard from the customers: "We have no interest in this product for human consumption. It is like the smell of horse's dung." We were discouraged.

The Central Soya Co. was aggressive in trying to sell isolated soy protein even in those days and was trying to penetrate the Japanese market. In 1965, Central Soya, Nikka Fats & Oils, and another pharmaceutical company concentrated their efforts to establish a joint venture to produce an isolated soy protein in Japan. However, this ended in vain.

In December 1967, Fuji Oil Company started production of isolated soy protein, though the production quantity was small. The present Fuji sales are several times larger than they were in those days. This product has viscoelasticity as one of the functional properties, as required by the Japanese meat industries, as well as improved color and flavor. At the present time, Ashai Oil Company also has produced isolated soy protein.

The growth of Fuji Oil in this field has been remarkable, and it is not too much to say that the history of the isolated soy protein in Japan is its history in Fuji Oil. However, most of its application is limited to the meat industry. Fortunately, I have been associated with Fuji Oil

in its work on isolated soy protein and would like to talk about the market needs, functional property, and application.

ISOLATED SOY PROTEIN MADE BY FUJI OIL

Market Needs in Japan

Soy protein products, such as concentrate washed with $CaCl_2$ ("Ca-soy protenate including residue"), together with acid washed concentrate and alkali washed concentrate, had been used in the meat industry as fillers. However, these products did not have any functional properties. Their markets were limited. Isolated soy proteins met the needs better. Market needs at the time were:

(A.) Cost savings.
(B.) Smooth sol at lower temperature like meat protein and gelling at high temperature with viscoelasticity. This functional property is unique since it is required by Japanese customers, because Japanese traditional foods, like fish kamaboko, have the same property. Furthermore, pressed ham, tuna, and swordfish also have a good viscoelasticity and were popular among the Japanese. Also, there are many sausages made of fish meat. We Japanese people prefer good viscoelasticity in our foods.
(C.) Capacity to hold much water.
(D.) Soluble in fresh water and salt water and emulsifying ability.
(E.) Improvement in quality. Substantial amount of starch was available in the market; but, to improve the quality of the product, soy protein was admitted to meet the requirement of these processed foods as a quality improver.
(F.) Prevention of the separation of water between the casing and the meat. The good functional properties of soy protein products gradually have been well accepted among the customers. The price of the soy protein products is rising, but at present these are indispensable in our meat industry.

Required Properties of Soy Products

Required properties of soy products are as follows:

(A.) Good sol in salt water with low viscosity.
(B.) Strong gel at heating.
(C.) The same gel property at 75% moisture as tuna and swordfish.
(D.) Good and smooth texture with meat.
(E.) Strong binding with meat.
(F.) Good emulsifying property with fat.
(G.) Good water binding, especially on heating.
(H.) Good color of the product.
(I.) No soybean flavor. Good mouth feel.

Applications

Applications are listed below:

(A.) Binder of pressed ham. Soy protein is used to make the functional properties of these materials, like tuna, swordfish, rabbit, and calf meat.
(B.) Control of moisture in the product.
(C.) Use as the stabilizer of emulsion in sausage.
(D.) Binder for sausage.
(E.) Capacity to hold the water in the sausage.
(F.) Protein supplement. Mutton or horse meat are used in Japan, but these have a special taste that should be avoided by washing. This causes the lower protein content of the product. Then, soy protein as enrichment of protein is added in the finished product.
(G.) Use as some meat products by JAS standard.

Our company now has, not only isolated soy protein, but also the concentrate and textured vegetable proteins. We will exert our best effort to develop soy protein products in the future.

Soy Proteins in French Products with a Meat Base

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INTRODUCTION

Soybeans have been used in China for thousands of years and have been produced for some time in the U.S. for oil. Very early, American technology tried to utilize the high food nutritive value of its proteins by concentrating them, isolating them from oil cake, then giving them texture by means of extrusion or spinning. For a few years, protein derivatives of soy have offered a great variety of presentation, as well as organoleptic qualities which never have been explored.

Their incorporation in products with a meat base is commonly practiced in the U.S. and in several European countries. A low producing cost and interesting technological properties make soy proteins an advantageous additive for meat products. Actually, their incorporation diminishes the cost while stabilizing emulsions and holding water in the final product.

In France the use of soy proteins, even of vegetable proteins, in traditional meat products is prohibited by definition in the code of practice. This legislation limits their use in new products without an actual outlet at the consumption level or in tinned goods destined for exportation, such as corned beef. Dog and cat food should offer an important outlet for soy, but at present giblets and bones are more interesting, economically speaking. Nevertheless, there is one notable exception: a significant use of soy base products is possible in stuffings and in ravioli croquettes, in couscous, and in several other dishes.

Although we cannot be absolutely certain, the French importation of products containing soy additives in 1972 must have been ca. 1000-2000 tons. It is also possible to ascertain that there is an ever increasing pressure on the part of the French curing industry to allow the incorporation of vegetable proteins in animal products. This demand is generated, at present, by four positive factors: economy, technology, acceptability by the French consumer, and nutritive value.

ECONOMIC FACTORS

Soy meals with a 50% protein content are priced more or less at 2F/kg. In contrast, the price of soy derivative concentrates is much higher and increases according to the protein content: 6F/kg for the 70% concentrate and 8F/kg for a 90% isolate. Products obtained by thermoextrusion (TVP) are resold at 9F/kg. Because of the flavor component in meat only one-third can be replaced by the rehydrated TVP. Volume usually is tripled by hydration. The resultant meat product, therefore, costs 3F/kg on an average. The use