several years. The inclusion of their names here does not imply that they are advertising or are even willing to provide samples. It would be the task of the recipient to persuade them to supply the merchandise.

SOURCES OF COCONUT FLOUR

1. Franklin Baker Co. of the Philippines
   ITC Building
   Buendia Avenue Extension
   Makati, Metro Manila
2. Blue Bar Coconut Philippines, Inc.
   JMT Building
   6764 Ayala Avenue
   Makati, Metro Manila
   Att'n Dr. Bienvenido Sison
3. Philippine Coconut Authority
   Food Research Division
   Don Mariano Marcos Avenue
   Diliman, Quezon City
   Att'n Miss Portia Marquez

LOW FIBER COCONUT PROTEIN PRODUCTS

1. Coconut Foods Pilot Plant
   University of San Carlos
   Talamban, Cebu City
2. National Institute of Science & Technology
   Taft Avenue
   Metro Manila
   Att'n Mrs. Olympia Gonzales

Future Suppliers

Here we can only speculate on the prospects. It would seem that the Philippines would be the most likely source, given their dominant position with 45% of world production, and also the fact that only about 2% of their coconut production is consumed as unprocessed nuts.

Coconut protein is a by-product of coconut oil production, with about 110 kg of protein corresponding to one metric ton of oil. This is only about 6% of the same factor for soybean, which contains about 1.9 tons of protein per ton of oil.

World production of coconut oil is only about 30% of soybean oil production. Taken together with the above cited figures, we calculate that potential coconut protein food supplies are only about 2% of potential soybean protein food supplies.

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Potato Protein for Human Food Use

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ABSTRACT

Potato protein can be produced as by-product of potato starch production in relatively large amounts. The technical problems concerning the production as well as the necessary purification of the protein for human consumption are mainly solved. However, the marketing of potato protein is difficult because it can be used, without purification, only in limited fields. Besides many physiological advantages, there may exist som hygienic risk factors which must be investigated in detail before potato protein can be applied by the food industry as a new source of protein.

World production of potato starch amounts to about 2 million tons (1), thereby the resulting potato fruit water contains about 2% protein besides other soluble substances. Half of the protein can be coagulated by direct steam injection into the fruit juice. The coagulate can be recovered by subsequent centrifugal separation and drying (2). This means that about 100,000 tons of potato protein could be produced if all potato starch producers would install a protein recovery system.

But there are some reasons why potato protein is not recovered. One reason is the relatively low protein concentration in the fruit water. The second reason is that this concentration is further diluted during starch extraction because of additional amount of water which is usually necessary for isolating the potato starch. This diluted fruit water is then either used for irrigation or discarded as waste water.

Due to severe pollution control regulations concerning the waste water quality and highly improved starch extraction processes which enable undiluted separation of the fruit water, the installation of a protein recovery system becomes more and more attractive.

But besides lower water pollution and the costs of the protein production, there are some properties of potato protein which are of great importance for its potential uses. These properties will be briefly outlined here.

Directly precipitated potato protein from potato fruit water is obtained with a purity of 80-85% without additional purification steps. The most important physical properties of potato protein are its insolubility and color. According to the precipitation conditions, the color varies from pale yellow to greyish-green or brown.

As far as the amino acid composition is concerned, the quality of potato protein is fairly good, considering that it is a vegetable protein. The biological value is about 80, compared to that of egg protein as 100 (3,4). Most important is its relatively high lysine content. This is why potato protein can be used in protein mixtures for raising the nutritional value. In contrast, it has a low methionine content (5).

Unfortunately, this protein has a pronounced taste and smell of cooked potatoes. Smell and taste are undesired, they are caused mainly by constituents of the potatoes adsorbed during the coagulation of the proteins. Furthermore, the taste is adversely affected by horny protein particles which are formed during protein precipitation. At consumption they are responsible for the impression of "sandiness." To avoid this impression, it is necessary to grind the protein particles to such a fineness that the taste sensitive papilla cannot notice the horny structure any more. Due to these properties, potato protein was used practically as a feed-stuff for chicken and pigs and partly as a milk powder replacement for growing cattle.

In our institute we tried to use potato protein coagulates without further treatment for human consumption. We enriched bakery products, especially crispbread, cookies, crackers, wafers and biscuits with potato protein (6). Negative effects on taste and smell were especially noticed in those bakery products where the dough had already passed a fermentation step. This can be explained by enzymatic reactions of the potato protein with accompanying components of the dried coagulates as well as by interactions with the flour and dough components.

The previously mentioned intensive "sandiness" can be noticed distinctly in bakery products with a high water content. It could not be removed completely, even though the particle size of potato protein was reduced to that of the flour particles. The hornification of the protein can be reduced to a certain extent by wetting the protein surface with a starch solution and a subsequent careful spray-drying. The addition of potato protein to flour mixtures will lead, in relation to its particle size, to a substantial increase in water-binding capacity of the doughs, resulting in bakery products with a higher water content. Unfortunately in this case the loaf volume is adversely affected (7,8).

Different bakery products tolerate various amounts of protein enrichment (9). Whereas in normal bread doughs the possibility of addition of potato protein is limited, the protein content in crispbread can be doubled without essential changes in its typical characteristics as crumb structure, specific volume, and hardness.

It can be deduced from this short summary of results that the use of unpurified potato protein for human consumption is limited due to many difficulties. To prepare pure potato protein, neutral in taste and smell, it is necessary to purify the raw protein carefully. The purification can be carried out preferably in two steps. In the first step, the decanted coagulate is suspended in warm water, whereby most of the accompanying components of low molecular weight, which are responsible for smell and taste, are removed from potato protein. The purity will increase to 90%. A following extraction step with alcohol will remove the rest of the undesired components (10); the protein content will amount to 93-95%.

The potato protein isolates obtained in this way have many fields of application. But it must be mentioned that in spite of careful purification there could be some risk factors involved, which up to now are not totally eliminated (11).

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Development of Field Pea and Faba Bean Proteins

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INTRODUCTION

This paper deals with legume seed proteins, namely proteins from field pea (*Pisum sativum*) and from field bean (*Vicia faba*), which most people today call faba bean. Both legumes belong to the N-fixing crops and are widely consumed as seeds by man. As for the production of protein concentrates or isolates, they are at the moment only used to a limited extent. However, because of their potential significance, they merit being included in this conference survey as future sources of vegetable food proteins. These two legumes present many advantages compared to the oil seeds with regard to the production of protein concentrates and isolates. The most pronounced advantages are that simple methods, like air classification and ultrafiltration, can be used as the separation steps.

COMPOSITION

Table I contains an example of proximate analysis of whole and dehulled pea and faba seeds (1). Methanol soluble sugars are ca. 7.4% for pea flour and 5.6% for faba bean flour (1).

Oligosaccharides, in particular stachyose and raffinose, are a little higher level in pea flour than in faba bean flour. In Figure 1, oligosaccharide contents are compared (2).

There is a considerable variation in protein content between cultivars. Bhatty (3) found 26 to 35% protein in 12 cultivars of faba beans. Continued breeding for high protein content is, therefore, still important. Another thing which seemingly is open for breeding is a desirable reduction of tannins.

Storage proteins in peas and faba beans are vicilin ($S_{20,w}$ = 7.1) and legumes ($S_{20,w}$ = 11.80). These proteins are similar to the 7S and 11S fractions of soy protein, but the legumin seems to possess a more compact structure than the 11S-fraction of soybeans. Furthermore, these proteins do not undergo association-dissociation reactions with change in ion strength to the same extent as is generally seen for soy proteins (4).

CROP YIELDS

Useful information about yields obtained in practical

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