Uses of Defatted and Partially Defatted Peanut Flours

JAMES J. SPADARO, Southern Regional Research Center, SEA/USDA, New Orleans, LA USA

ABSTRACT

Defatted peanut flour produced by direct solvent extraction and partially defatted peanut flours produced by mechanical pressing have many potential uses in foods. The defatted peanut flour has a high protein solubility and is light colored, practically tasteless, and odor free. The defatted peanut flour has been evaluated as: an additive to increase the protein content of foods such as bread and other baked goods, macaroni, pancakes, and puddings; an extender in meats such as meat loaf and frankfurters; and an aid in preparing skim and full-fat (fat added) milk-like drinks and ice creams. The characteristics of this flour also make it useful in the preparation of protein concentrates (by air classification) and protein isolates. The partially defatted flour, with about 55% oil removed, is ideal for preparing full-fat, milk like drinks and can also be used in baked goods, ice cream, meats, and so forth. This flour can also be toasted to different degrees for use in foods such as baked goods, in which a nutty flavor may be desired. The "over roasted" flour has potential for use as a cocoa diluent.

In the United States peanuts are used primarily as food. More than one-half of the peanuts are utilized for peanut butter. In other countries most of the peanuts are processed into oil and meal, and the meal is used as animal feed or as fertilizer. In recent years there has been considerable interest in the development of new uses for peanuts as food and in food products. Examples are low-fat peanuts as a snack item, simulated nut meats for confectionery and baked goods, partially defatted peanut granules in breakfast bars, and various peanut flours (1-5). The greatest interest has been in peanut flours.

Peanut flours ranging from defatted flour containing less than 2% lipids to full-fat flours have been produced experimentally and to a limited extent commercially. The flours and the method of their production include:

1. Defatted peanut flours produced by direct solvent extraction or by prepress solvent extraction.
2. Partially defatted peanut flours produced by mechanical pressing of essentially raw peanuts to remove 50% to 60% of the oil. The pressed peanuts or flours can be heated to obtain flours with different degrees of roast and for different potential uses.
3. Partially defatted peanut flours produced by screw pressing of heated peanuts to remove 80% to 90% of the oil.
4. Concentrates and high protein flours produced by air classification of defatted peanut flours with and without skins.
5. Full-fat peanut flour produced by grinding, slurrying, heating, and spray drying or drum drying.

In this presentation, emphasis will be placed on peanut flours developed at the U.S. Department of Agriculture's Southern Regional Research Center (SRRC) in New Orleans, Louisiana.

By direct solvent extraction, a defatted peanut flour has been produced with the following characteristics: less than 2% residual lipids, essentially white, no raw peanut flavor, a high protein solubility of over 85%, and a protein content of 65%.

This peanut flour has been evaluated in numerous end uses. One company has stated that "the peanut flour was found to be acceptable as a protein supplement and functional ingredient in the specific food systems studied." This company evaluated the flour in foods such as macaroni, bread doughs, and frankfurters, in which the levels of flour used were 12½%, 11%, and 10%, respectively. From an overall performance standpoint including appearance, color, and flavor, the company concluded that this flour ranked first in order of preference over three other flours evaluated. The main drawback seemed to be that doughs prepared with the flour tended to be sticky, a factor that may be overcome by changes in processing.

Several other organizations have evaluated the flour in foods such as cakes, cookies, soups, gruels, puddings, spreads, gravies, meat loaf, ice creams, snack items, and breakfast cereals. At SRRC, levels of 10% to 25% peanut flour were extruded with white and brown rice to produce cheese-flavored and peanut-flavored snack items. Also, the extruded products were comminuted to produce a high protein breakfast cereal product that proved satisfactory when consumed with milk and sugar. The flour has been used satisfactorily to replace one-fourth to one-half of the milk solids in ice cream.

Peanut milks have been prepared by adding one part of the flour to nine parts of water to produce a skim milk product. Also, by adding the appropriate amount of desirable fat, a full-fat milk can be produced.

The extracted peanut flours have been air classified to produce a first fraction, a concentrate containing 70% to 72% protein, and a second fraction, a flour containing 50% to 60% protein. The concentrate can be used like the flour, but less is required to attain the same protein level. Unblanched peanuts also have been directly extracted to produce a flour with skins. The flour was air classified to produce a light colored, high protein concentrate fraction free of skins and a flour fraction that is lower in protein (ca. 50%) and which contains the skins. The dark color because of the skins makes this flour fraction desirable as a meat extender.

Currently, we are evaluating the incorporation of defatted peanut flour in gruel type blended food formulations, including general purpose and high calorie weaning blends containing either corn or wheat and peanut flour, whey protein concentrate, and lysine hydrochloride (6). Chemical score for each was about 83, compared to 78 for the CSM (corn-soy-milk) blend.

One researcher prepared defatted peanut flour from white skin peanuts and blended the flour with a citrus seed flour in ratios of 3:1, 1:1, and 1:3. The high methionine content of the citrus seed flour compensated for the low

methionine in peanut flour. The author reports (7) that characteristics of the blends are such that they may be used in cloudy, fruit-flavored or milk-like beverages or as meat extenders and in bakery goods.

The peanut flours have also been used to prepare protein isolates with a protein content of over 90%.

A series of partially defatted peanut flours with 50% to 60% of the oil removed by hydraulic pressing of raw peanuts is being produced. The pressed peanuts, either as is or roasted, are ground into a flour. This treatment produces flours ranging from a white, essentially bland flour to those having increasingly darker colors, that is, tan to brown, and containing a nutty flavor. These flours have about 30% protein and 33% lipids. They are useful in a variety of products. The bland flours are particularly useful in food systems in which other flavors are to be picked up, whereas the other flours can be used in foods requiring a peanutty flavor.

The partially defatted peanut flours have been evaluated in products such as dry cookie and cake mixes, peanut soup, peanut butter candy, as a replacement for caseinate in a wide variety of foods, as a chocolate extender, and in the preparation of bacon bits.

Full-fat peanut flours have been prepared by several organizations. In general, preheated peanut flakes are ground, made into slurry with water, and drum dried or spray dried. Several uses have been suggested for this flour: as meat extenders using up to 20% flour; in potato flakes using 25%, 50%, and 75% flour; in the formulation of boneless chicken and turkey rolls; in simulated coconut candy; and in cheese-peanut flakes.

The potential for increased consumption of peanut products is appreciable, because peanuts are an important source of food protein. Peanut flours and concentrates are an effective means of utilizing peanuts as a source of food protein.

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Chemical Constituents and Protein Food Processing of Rapeseed

A. RUTKOWSKI, Institute of Food Technology Agricultural University, 03-849 Warszawa, Poland, **H. KOZLOWSKA,** Institute of Engineering and Biotechnology Agricultural University, 10-957 Olsztyn, Poland

ABSTRACT

In rapeseed, as in other oilseeds, there are some substances that adversely affect nutritional value. By application of appropriate technological processes, the antinutritive factors are removed and the final protein products appear to have high nutritive value. Compared with the soybean, rapeseed presents some unique problems. When processing rapeseed into protein foods, it is necessary to take into account high losses of nitrogen substances (nonprotein nitrogen), and higher costs of removing glucosinolates and their derivates, as well as phenolic compounds. Technically and economically feasible methods of reducing cellulose and phytate contents should be developed. In view of the presence of many constituents which lower the nutritional value of rapeseed protein products, it would appear that rapeseed is presently not a suitable raw material for production of food grade protein flour and grits. On the contrary, rapeseed protein concentrates and their texturates have satisfactory nutritional quality and feature good functional properties. Rapeseed isolates, except for poorer spinning properties, have similar characteristics to those of soybean isolates, but, as a result of low protein yields, their production is uneconomical. Recent progress in the breeding of glucosinolate-free and low fiber rapeseed varieties offers a new approach for development of processing methods for useful protein products based on this raw material.

Rapeseed is of interest especially in the Northern and Central European countries and in Asia, as a raw material for the production of protein food. In these regions of the world, rapeseed is well adapted to climatic conditions, and it also features a high level of essential amino acids. Nevertheless, processing it into a protein food is much more difficult than processing soybean, both because of the nonprotein constituents of the fat-free meal, and the fact that it contains substances of an antimetabolic nature. In practice, the latter makes it impossible to obtain food grade protein flour and grits directly from the rapeseed. It is possible, however, to obtain high quality protein concentrates and isolates after removing certain constituents, which will be discussed using data from our investigations.

First of all, rapeseed is substantially different from soybean in basic constituents. While the oil content is more than twice that of soybean, the protein content of both seed and meal are substantially less (Table I). However, rapeseed proteins are rich in lysine, sulphur-containing amino acids, and other essential amino acids (Table II).

Rapeseed contains several antinutritional factors which have adverse effects on animal performance and limit the potential for obtaining food grade flours from deffated meals. These include nonprotein nitrogen compounds, oligosaccharides, crude fiber, phytins, phenols, glucosinoleates, trypsin inhibitors, and hemagglutinins. Nonprotein nitrogen is present in rapeseed in much greater quantities than in the soybean. This fraction is composed of peptides and free amino acids, the products of the incomplete synthesis or hydrolysis of proteins, and also nucleic acids, glucosinolates, ammonia, nitrogen and other N-containing substances. Since a great part of the nonprotein nitrogen substances remains soluble when proteins are