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HEAT EFFECTS ON PEANUT PROTEINS

Effect of Processing on the epsilon-Amino Groups of Lysine in Peanut Proteins

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Peanut flour can be analyzed for protein deterioration by following the change in the ε-amino groups of lysine, which was determined colorimetrically as the ε-2,4-dinitrofluorobenzene derivative

THE INCIDENCE of protein malnutrition in children living in areas of the world where an animal industry has not been developed has led to the quest for sources of high quality vegetable proteins that might alleviate the symptoms of protein deficiency in growing children. Peanut flour, as a source of protein, has come under consideration, because peanuts are grown widely throughout the world as a source of edible oil. The quality of the protein in peanut meals and flour, therefore, is of interest.

Using analyses for ε-amino groups of lysine as an index of protein damage in an experiment, it was found that peanut cotyledons subjected to the highest heat for the longest period of time during the cooking operation showed the greatest decrease in this value for lysine. The value decreased from 3.4 grams of lysine per 16 grams of nitrogen for blanched cotyledons to a value of 1.9 for the meal prepared from cotyledons after a 2-hour cooking operation. However, the value decreased to only 2.8 grams of lysine per 16 grams of nitrogen in the meal when the cooking was at a lower temperature, and limited to 1 hour. The effect of heat, during processing, on the lysine content is similar to those reported for cottonseed by Conkerton, *et al.* (*2*).

Two tons of United States grade No. 1 Spanish peanuts were processed in a typical oil mill utilizing oil cooled screw presses for oil extraction. After cracking, water was added to maintain a moisture level of 3.5% in the first lot, which was cooked at 248° to 250° F. for 2 hours. A second lot was cooked for 1 hour at temperatures varying from 232° to 234° F. and at a moisture content between 5.6 and 6.0%. Each lot was then transferred to a conditioner where the moisture was adjusted to a level which would permit the passage of the material through the screw presses (2.4% in the first run and 4.8% in the second). Temperature of the cake from the presses in both runs was the same, i.e., 300° F. The cake was reduced to flour by hammer mills.

Samples were removed at each step of the processing. Lysine was determined by use of the procedure described by Conkerton and Frampton (*1*), in which the whole flour reacts with 2,4-dinitrofluorobenzene, is hydrolyzed with 6*N* hydrochloric acid, and the amount of ε-DNP-lysine liberated is measured colorimetrically (*1*). Table I shows there is a progressive reduction, during processing, of the ε-amino groups of lysine in peanut protein, and that this damage is due to the amount of heat developed.

Table I. ε-Amino Lysine Values for Peanut Cotyledons, Cake, and Meal

Product	*Lysine, Grams/16 Grams of Nitrogen*	
Blanched cotyledons (uncooked)	3.4	
	Cooked 2 hr. at 248–50° F.	Cooked 1 hr. at 232–34° F.
Cracked cotyledons from cooker	2.9	3.3
Cracked cotyledons from conditioner	2.7	3.1
Press cake from screw presses	2.3	3.0
Meal from hammer mill	1.9	2.8

Preparation of peanut flour for human food will require processing conditions which involve a minimum heat damage to the protein.

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