Table 1. Approximate percentage composition of selected animal protein.

Amino acids	Beef muscle	Casein	Egg albumen	Protein from waste fish flesh
Cystine	1.1	0.35	1.9	0.49
Lysine	8.2	7.6	5.0	1
Histidine	2.9	2.1	1.7	2.5
Arginine	7.2	4.3	5.9	2.5
Serine, glycine, aspartic acid	16.7	14.3	18.7	7.3
Threonine, glutamic acid	20.6	27.1	21.5	12.9
Alanine	5.6	5.5	7.2	1.5
Tyrosine	4.4	6.7	4.3	3.0
Methionine, valine	8.12	9.9	11.9	8.0
Leucine, isoleucine	13.1	16	17.1	5.3

and fresh whole milk, 3.3 percent. This hydrolyzed fish protein contains all the principal amino acids in amounts that are fairly adequate for human consumption (Table 1) in comparison with other food products. It is very useful in treating cases of malnutrition, tuberculosis, and duodenal and ventricular ulcers and as a supplement to the diets of convalescent patients.

The general properties of hydrolyzed fish protein are the following. (i) It is easily soluble in water. (ii) The keeping quality in powder form is quite good. (iii) The whipping power is greater than that of egg albumen. Its properties are such that it could be used in the plastics, paint, leather, and rayon-fiber industries.

By preparing hydrolyzed fish protein on a laboratory scale, it has been found that the cost of the product is such that it can be sold much less expensively than many similar products manufactured by other means. Another aspect to consider in manufacturing this product is the fact that waste resources would be utilized that might otherwise have never come to such prominence in combating malnutrition in the world.

After testing the product on only a few patients, the demand has become very great. The investment for establishing a small plant would be moderate. And there is no doubt that the establishment of such a plant would certainly help millions of children and adults dying of malnutrition.

We express our gratitude to the superintendent and to the staff of the S.C.B. Medical College Hospital, Cuttack, for experimenting with our product on their patients. Affidavits to show the beneficial effects from hydrolyzed fish protein in treating hospitalized patients can be obtained by writing to us. R. Rajgopalan and the staff of the Department of Biochemistry of the Indian Institute of Science, Bangalore, also deserve our gratitude for their scientific help.

G. B. MOHANTY
A. B. ROY
Department of Fisheries, Orissa, India

10 November 1954.

Report on Wax from Several Species of *Tillandsia* and from *Ananas comosus* (L.) Merr.

In 1953 we reported (*1*) that a hard wax, melting at 79° to 80°C, was extracted with organic solvents from *Tillandsia usneoides* L., Spanish moss. This wax imparted a glossy finish to woodwork and leather and has since, according to Bennett (*2*), been utilized in automobile polishes on an experimental basis. An investigation of the waxes of other species of this family was undertaken to determine whether the waxes of the epiphytic and terrestrial species were similar and also to find other sources of commercial supply if extraction of Spanish moss wax on a commercial basis became practical. Some species, such as *T. Balbisiana* and *T. fasciculata*, have already been cultivated by florists (*3*) on a limited scale. Cultivation of some species would be necessary if Spanish moss wax became a commercial item.

Tillandsia tenuifolia L., *T. juncea* Poir., *T. Balbisiana* Schult., *T. aloifolia* Hook., *T. simulata* Small, *T. fasciculata* Sw., and *T. circinata* Schlecht. all have hard waxes similar to that in *T. usneoides* L. It was reported earlier (*4*) that these species contain estrogenic substances. The waxes of these species comprise 4 to 5 percent of the fresh weight of the plants. From the pineapple, *Ananas comosus* (L.) Merr. of the same family, a soft wax, melting at 51°C, was extracted with organic solvents, such as acetone, chloroform, and petroleum ether. From the waste of pineapple fruits 1.4 percent wax was reclaimed. The pineapple wax had a saponification number of 232.4, an acid value of 57.1, an ester value of 175.3, and an iodine number of 49.9. The wax contained 59.5 percent unsaponifiable material. A positive Liebermann-Burchard reaction (*5*) for steroids was obtained as well as a positive vaginal smear in ovariectomized rats tested by the Allen-Doisy method (*6*), indicating the presence of a substance possessing estrogenic activity in the steroid fraction.

SELDON D. FEURT*
LAURETTA E. FOX
Department of Pharmacognosy and Pharmacology, College of Pharmacy, University of Florida, Gainesville

References and Notes

1. S. D. Feurt and L. E. Fox, *Science* **117**, 600 (1953).
2. R. B. Bennett, Engineering and Industrial Experiment Station, Univ. of Florida, personal communication, 30 Aug. 1954.
3. R. Lewis, Orlando, Florida, personal communication, 1 June 1951.
4. S. D. Feurt and L. E. Fox, *J. Am. Pharm. Assoc.* **41**, 453, (1952).
5. F. C. Koch and M. E. Hanke, *Practical Methods in Biochemistry* (Williams and Wilkins, Baltimore, 1948), p. 41.
6. E. Allen and E. A. Doisy, *J. Am. Med. Assoc.* **81**, 819 (1932).

* Present address: Department of Pharmacology, School of Pharmacy, University of Georgia, Athens.

23 September 1954.