PREPARATION OF LEAF PROTEIN CONCENTRATES FROM LEUCAENA LEUCOCEPHALA

Leaf protein concentrates are manufactured from alfalfa in 3 small plants in Europe where there is actually a protein surplus. In the humid tropics, however, where protein shortages are common, alfalfa does not thrive well. Few sources of vegetable protein can compete economically in the lowland tropics with Leucaena leucocephala—a mimosoid legume that can yield more protein than alfalfa. In the following study, the preparation of detoxified green protein concentrate and pressed residue from leucaena is described.

The plant material for this study was grown without fertilization at the Mayaguez Institute of Tropical Agriculture (USDA), or was collected from plants growing wild in western Puerto Rico. Plants were cut about 15 cm above the soil level, and leaves were separated from the stems and cut to lengths of 2-3 cm. A 600 g sample was macerated with an equal weight of ice and double volume of water in a stainless steel Waring blender for 5-10 minutes at high speed. The slurry was filtered immediately through a commercial nylon mosquito screen, then through a canvas filter bag. The dark green juice was collected in a large flask. After 15-20 minutes at room temperature, a green flocculent protein coagulated. It was collected and centrifuged in 200 ml pyrex bottles at 5200 XG. The green protein was stirred twice with 0.05N HCl and recentrifuged then washed until acid-free with tap water and centrifuged again for 10-15 minutes.

The green protein concentrate was spread with a spatula in thin layers on a glass plate and air-dried for 24 hr in an air-conditioned dark room. The dried product was scraped from the glass plate and ground in a mortar to a fine powder.

The protein concentrate had 38.9% protein (some very fine fibers passed the filter). The lipid content was 9.2%. The amino acid distribution of the concentrate from leucaena was similar to that of alfalfa prepared by commercial processes. It is noteworthy that leucaena protein was higher in lysine, methionine and cystine.

The pressed residue slurry from the canvas filter bag was then soaked overnight in 0.1 N HCl, filtered through a coarse glass filter, and washed with water. The acid treatment was repeated 3 times.

The pressed residue retained 21.5% protein (from 23.6% in original sample); residue following a second extraction contained 17.8% protein. During maceration it had been observed that a thick mucilage formed, and was extremely difficult to filter. This mucilage clearly contained much of the protein in the original sample. By dilution with additional 2 parts of water, this was improved somewhat. This precipitation of mucilage was recognized to be caused by condensed tannins. The initial precipitation was terminated in 5-10 minutes, and the mother liquor still
contained sufficient amounts of condensed tannins to be able to precipitate green protein from leaf extracts of other legumes (e.g., siratro). No mimosine occurred in these residues or in the protein concentrate.

In a second study it was found by rat feeding trials that the nutritional value of leucaena leaf protein concentrate was very low (Cheeke et al., 1980). This unsuccessful attempt in isolating a good leaf protein concentrate from leucaena suggests that focus be shifted to finding leucaena varieties with low levels of condensed tannins. Mimosine is not considered a problem, as it had been eliminated entirely by the simple and economical acid washes employed. The presence of high level tannins negate our expectation of producing valuable green protein concentrate at the present time from leucaena.

Reference: