Unconventional protein sources:
“date seeds”


(Received June 2, 1981)

Egypt suffers from the same problems of other developing countries most important of which is the problem of food consumption. Protein in the Egyptian diet is mainly from plant origin. By consulting the food balance sheet for the year 1978. It was found that from the total protein intake 94.9 g/caput/day, 81.6 were derived from vegetable origin and only 13.3 gm from animal origin.

Attention has been directed towards the re-evaluation of the different natural sources of proteins in an attempt to improve the quality of the protein consumed, either by raising the production of conventional (animal and plant) protein sources, increasing the cultivated area, applying agricultural mechanisation or using unconventional protein sources from oil seeds, fish flour, and protein produced from algae, fungii and yeasts.

Date (Phoneix decatylifera) seeds were chosen for our study in order to investigate the possibility of using them as a new source of food protein.

Materials and methods

Selection and preparation of samples:

The local varieties of date seed, Balady (fresh), Amhat (merattab), Siwy (dry), Asouty (fresh), Zaghoul (fresh), Ebrimy (dry), Ramly and Agwa were obtained from local markets, while Samany variety (fresh), was obtained from Kaha (Food Processing Factory).

It should be mentioned that:
1. Fresh date has a crisp texture.
2. Merratab and Ramly are overripened fruits. They are juicy, darker in colour than the fresh ones and the skin comes off easily by hand. Agwa is the overripened fruit (Merratab) that was partially dried for preservation.
3. Ebrimy is the dried date that absorbs water on soaking. Seeds were washed, drained, dried in the air and ground for analysis.

Chemical analysis

Moisture, crude protein, ether extract, ash and phosphorus were determined according to the methods recommended by the Association of official Agricultural Chemists (1965). Soluble proteins were extracted at 20 degrees centigrade and at 100 degrees Centigrade using nitrogen free water, nitrogen was determined in both the extract and residue. Fiber was determined according to Pearson (1962). The method
used for iron determination was that of Elvehjem (1930). Calcium was determined according to Kramer (1921). Carbohydrate content was calculated by difference. The dried defatted samples were subjected to acid hydrolysis for 24 hours. The amino acids in the hydrolysates were separated by the two dimensional paper chromatography technique of Block et al. (1958). The solvents used were butanol, acetic acid and water (4:1:5) in the first run, and 0.3 % ammonia in 80 % phenol in the second run. Quantitative determination was made, whenever possible for some of the separated amino acids using the method of Giri et al. (1952). Tryptophan was not determined as it is destroyed by the acid hydrolysis.

**Biological evaluation of the seed's protein:**

The following basal diet of Campbell (1961) was used.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn starch</td>
<td>80 g</td>
</tr>
<tr>
<td>Cotton seed oil</td>
<td>10 g</td>
</tr>
<tr>
<td>Cellulose</td>
<td>5 g</td>
</tr>
<tr>
<td>Salt mixture</td>
<td>4 g</td>
</tr>
<tr>
<td>Vitamin mixture</td>
<td>1 g</td>
</tr>
</tbody>
</table>

The salt mixture used was that of Hubbel et al. (1937) and the vitamin mixture was that of Campbell (1961). The dried powdered defatted samples were added at the expense of starch to produce 5 % level of protein intake in case of date seeds and 10 % protein level in case of apricot kernels. Casein was used in the standard diet at both 5 % and 10 % levels.

**Determination of the protein efficiency ratio (P.E.R.):**

The method used was that of Campbell (1961). Weanling albino rats of a single strain of 20–23 days old were used. The rats were divided into groups of 6 animals for each diet. The groups were equalised as nearly as possible with respect to sex and weight. Diets and water were supplied ad libitum. The experiment was extended for four weeks at the end of which calculations of the protein efficiency ratio (P.E.R.) were made for each rat. P.E.R.'s for experimental diets were recalculated as percentage of that for casein.

**Determination of the net protein ratio (N.P.R.):**

A control group of rats of nearly equal weight and age as in P.E.R. experiment was fed a protein free diet for 10 days to determine the loss in weight corresponding to the maintenance requirements of the rats. An approximate estimate of N.P.R. was done for the four weeks period from the loss in weight of group means over 10 days period.

**Blood analysis:**

At the end of the experimental period rats were killed by chloroform and blood samples were taken by cardiopuncture. The total serum protein was determined by Kjeldahl method according to the A.O.A.C. (1965). Serum samples of 0.2 ml were subjected to electrophoretic separation of proteins. The apparatus used was that of Elphor and the separation was carried out at pH 8.9 for 18 hours using Durrum method (1950). Dye used was bromophenol blue. Elution of the stained bands was carried out using 0.5 % sodium carbonate solution and the albumin/globulin ratio was determined colorimetrically. The free nonessential/essential amino acids ratio was determined using the method of Abdou and Awadalla (1973).