The Food Yeast

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DURING war-time food requirements of a nation create many difficulties which can be overcome only by the proper study of the problem from the economic and scientific point of view. In 1939 due to the Anglo-American blockade, Germany was confronted with the difficult task of filling the gap in their protein and fat supplies which were formerly imported. As the possibility of its being a prolonged war was visualised, utmost effort was made to develop domestic sources for satisfying their needs. A programme for the production of synthetic protein and fat was therefore worked out.

Though first prepared by Mason in 1792, the use of yeast as a protein food was first attempted by Voeltz and Baudrexal only about 1910. It was introduced by Delbrueck and Henning in Germany during the first World War, using molasses as a raw material. Large scale manufacture was then planned in Germany but with the end of the war further interest in the practical aspects of this problem ceased. The use of food yeast on a large scale was again introduced in 1936. The demand increased considerably during the second World War. The extreme importance of yeast in the food supply of Germany in 1944 was evident from the fact that the programme of plant expansion had been specially approved by Hitler in 1943. An order by Göring in April 1944 gave the yeast programme the same priority as the mineral oil programme. In spite of the elaborate plants set up for the yearly production of about 130,000 tons, the actual production of dried yeast probably reached a maximum rate of 16,000 tons only.

Nutritionally, yeast is a very rich source of good quality protein and vitamins of the B complex group. The average composition of good quality dried food yeast is as follows:

Protein	... 50.0%
Ash	... 7.0%
Fat	6.0%
Phosphate (P_2O_5)	... 4,0%
Lead	... 0.001%
Arsenic	... 0.001%

Although crude protein content is about 50%, the pure protein content is about 35 to 40%. Chemical analysis indicates that yeast protein from the viewpoint of amino acid content is a 'high value' protein, rich in the most essential amino acids and superior to plant but not quite equal to animal proteins. Except for cysteine and methionine, the essential amino acids in yeast are sufficient to fill the normal dietary requirements. The ash content is relatively high. In the ash, while phosphate and potassium are the predominant components, magnesium, calcium and other elements are also present in quantities sufficient for human needs. Trace elements, fat and other constituents are present in smaller quantities which are, however, generally considered beneficial. Vitamins of the B complex group are the main biotic factors with respect to human and animal nutrition. Thiamine, Riboflavin and biotin are present in large amounts. The amount of Nicotinic acid is also considerable though it is claimed in Germany to be of less nutritional significance. Dried yeast contains 4500 to 4700 calories per kgm. and 1 kgm. of yeast would correspond to 4.16 kgm. fresh eggs, 2.77 kgm. fat beef, 2.38 kgm. herring or 2.38 kgm. pea flour in terms of energy content. The digestibility of yeast is also relatively very good. Thus, yeast is advant-

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ageous for its high energy content and high good-quality protein content and as a rich source of vitamins and growth factors.

Yeast is manufactured in various countries from a variety of raw materials. The efficiency of utilizing glucose in yeast 'synthesis' is of the order of 65%. Various raw materials used are molasses, sulphite waste liquor, wood sugar prehydrolysates, whey, potatoes and waste products of potatoes. Selection of the raw material depends upon its availability and cost. Molasses is supposed to be the best growth medium for yeast and the percentage of fermentable sugars in the molasses is also high (about 50%). Due to the shortage of sugar, raw materials other than molasses are used in Germany. In Jamaica, a process for the continuous production of food yeast from molasses has been developed and the yeast manufactured is added to the flour consumed on the island as a vitamin and protein dietary supplement. The Standard Yeast Co., Ltd., Essex, produces five to ten thousand tons of baker's yeast annually using molasses as the raw material.

Food yeast is mainly used as a substitute for meat and as a meat extender in the extracts, soups, sauces, sausages, and as a flavouring for vegetable dishes. It is used in dry condition in the form of powder or flakes. The production of food yeast has already been adopted on a large scale in some countries and it is technically and economically successful but does not rank as one of the 'preferred' foods. In Great Britain, food yeast in terms of its protein content is only one-tenth of the price of lean meat. However, its use, at present, is restricted largely to feeding horses, cattle, pigs and poultry where its price compares unfavourably with other feeding stuff. Good quality food yeast is largely used in medicine as a B Vitamin source.

In view of the present food situation in India the problem of the manufacture of food yeasts of high vitamin and protein content is of vital importance. As already mentioned, molasses is one of the best raw materials available for the manufacture of food yeast. In this country, molasses is produced in large amount as a waste material and presents problem of its disposal. The statistical data from 1947 onwards on the production of molasses are presented below:—

Year	*Molasses produced.*
1947-48	410,800 tons.
1948-49	369,800 „
1951-52	598,400 „
1952-53	508,500 „

Therefore, by utilizing molasses for the production of food yeast we can cut down our food import to an appreciable extent. However, to make the project a success some work will have to be done also to develop preparations of yeast more suitable to Indian palate.

Fluorescent or Optical Whitening Agents

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THE phenomenon of absorption of light from an exciting source and re-emission as a light of a different wavelength by a substance is known as Luminiscence. If the emission of light ceases as soon as the exciting light is cut off the

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