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# NUTRITIVE VALUE OF BALANCED MALT FOODS

Many countries in Asia, Africa and Latin America are not able to produce sufficient quantities of protective and protein-rich foods such as milk, eggs and fish[1]. The diets consumed by weaned infants, young children and other vulnerable sections of the population consist predominantly of cereals, roots and tubers and hence are deficient in proteins, certain vitamins and minerals. Deficiency diseases are, therefore, widely prevalent among weaned infants and young children[2].

During recent years, vegetable proteins have been utilised for supplementing the diets of weaned infants and yonng children[3]. Several workers[4] have successfully used milk from soya bean and groundnut for feeding infants. Chick and Slack[5] and Dean[6] have shown that a highly nutritious food can be prepared by blending barley malt extract with soya flour, which could be used to replace about half the milk in the diet of infants up to one year of age and even more in the diet of older children. A process for the preparation of balanced malt food based on a blend of cereal malt, groundnut flour and skim milk powder was developed by Chandrasekhara *et al.*[7]. Experiments on albino rats showed that the malt foods possessed high nutritive value. Subrahmanyan *et al.*[8] also found that snpplementation of tbe diet of children with two ounces of malt food produced a marked improvement in their growth and nutritional statns. Skim milk powder being scarce, the nutritive value of malt foods based on blends of vegetable proteins sucb as pulses, groundnut flour and sesame flour as compared with blends containing skim milk powder has been studied.

The present communication deals with studies on the overall nutritive value of four blends of malt foods using albino rats.

*Ragi* malt used in this investigation was prepared according to the general method described earlier[7]. Four blends of malt foods were prepared (Table 1). The amounts of *ragi* malt and groundnut flour were kept at the same level in all the blends. Two of the blends (A and B) contained defatted soya flour, while the other two (C and D) contained Bengal gram flonr in place of soya flour. Malt foods I and III contained sesame flour (at 20 per cent level) while in foods II and IV, sesame flour was replaced hy an equal amount of skim milk powder. For comparing the nutritive value of malt foods, a milk food having a similar composition was prepared. All the foods were adequately fortified with vitamins and minerals. The chemical composition of the malt foods and the milk food determined according to A.O.A.C. methods[9] is given in Table 2. For the purpose of the feeding trials, the malt foods were mixed with starch and sugar in equal proportions so that the protein content of the different diets was approximately 20 per cent. Composition of the experimental diets is given in Table 3.

TABLE 1. *Percentage composition of malt foods* and milk food*
(Values per 100g)

| | Malt foods | | | | Milk food |
|---|---|---|---|---|---|
| | (A) | (B) | (C) | (D) | |
| Ragi malt ... ... | 22 | 22 | 22 | 22 | ... |
| Groundnut flour ... | 25 | 25 | 25 | 25 | ... |
| Soyabean flour ... | 30 | 30 | ... | ... | ... |
| Bengal gram flour ... | ... | ... | 30 | 30 | ... |
| Sesame flour ... | 20 | ... | 20 | ... | ... |
| Skim milk powder ... | ... | 20 | ... | 20 | 70.0 |
| Vanaspati ... | 3 | 3 | 3 | 3 | 9.0 |
| Starch ... ... | ... | ... | ... | ... | 18.0 |

* The calcium, phosphorus and vitamins A, C, D, thiamine and riboflavin were adjusted to nearly the same level by fortification.

TABLE 2. *Chemical composition of malt foods and milk food*
(Values per 100g)

| | Malt foods | | | | Milk food |
|---|---|---|---|---|---|
| | (A) | (B) | (C) | (D) | |
| Protein (N×6.25) (g) | 36.9 | 37.9 | 28.7 | 29.60 | 25.2 |
| Fat (g) ... ... | 10.2 | 7.7 | 9.6 | 7.2 | 9.0 |
| Carbohydrate (g) ... | 36.1 | 39.5 | 45.3 | 47.9 | 54.4 |
| Calcium (g) ... | 1·41 | 1.38 | 1.44 | 1.42 | 1.44 |
| Phosphorus (g) ... | 1.15 | 1 10 | 1.14 | 1.17 | 1.2 |
| Iron (mg) ... ... | 8.3 | 7.9 | 8.0 | 8.2 | 8.0 |
| Vitamin A (I.U.) ... | 3000 | 3000 | 3000 | 3000 | 3 00 |
| Thiamine (mg) ... | 0.9 | 0.95 | 0.96 | 0.93 | 0.92 |
| Rihoflavin (mg) ... | 1.32 | 1.35 | 1·34 | 1.31 | 1.32 |
| Vitamin C (mg) ... | 30 | 30 | 3 0 | 30 | 30 |
| Vitamin D (I.U.) ... | 3 0 | 300 | 300 | 300 | 300 |
| Calories ... ... | 384 | 379 | 382 | 375 | 399 |

TABLE 3. *The composition of experimental diets**

| | Diets | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV | V |
| Malt food (A) ... | 54 | ... | ... | ... | ... |
| Malt food (B) ... | ... | 53 | ... | ... | ... |
| Malt food (C) ... | ... | ... | 70 | ... | ... |
| Malt food (D) ... | ... | ... | ... | 67 | ... |
| Milk food ... | ... | ... | ... | ... | 79 |
| Corn starch ... | 26 | 27 | 10 | 13 | 11 |
| Cane sugar .... | 20 | 20 | 20 | 20 | 10 |

* The protein content of the diets was about 20%.

The nutritive value of these blends was determined by the rat growth method. Five groups of albino rats (28 days old) distributed equally with regard to sex, litter mates and body weight were fed on the different diets. The malt foods or the milk food served as the sole source of all dietary essentials in the diet. Careful records of daily food intake and weekly gains in weight of the animals were maintained. The results are shown in Table 4.

TABLE 4. *Average weekly increase in body weight of rats fed on diets containing malt foods and milk food*
(Duration of experiment—8 weeks. No. of animals in each group—4 males and 6 females)

| Diet | Average initial weight (g.) | Average daily food intake (dry wt.) (g.) | Average weekly gain in weight (g.) | |
|---|---|---|---|---|
| Malt food (A) ... | 45.4 | 9.9 | 15.59 | |
| Malt food (B) ... | 45.5 | 10.3 | 16.90 | |
| Malt food (C) ... | 45.2 | 9.8 | 16.58 | ± 0.47 (32 d.f.) |
| Malt food (D) ... | 45.2 | 10.3 | 17.10 | |
| Milk food ... | 45.2 | 9.8 | 16.15 | |

Least significant difference (P = 0.05) 1.36 g.

Statistical analysis of the data showed no significant difference in the growth promoting value of the foods. Substitution of soyabean flour by Bengal gram flour or the substitution of skim milk powder by sesame cake did not affect the overall nutritive value of the foods as judged by the growth of rats. Soyabean flour being not abundantly available in the country, it can be substituted by Bengal gram flour. Malt foods containing sesame flour give the same growth rates as those containing skim milk powder; still, the foods containing milk powder are more acceptable than those containing sesame flour to the consumers.

Further investigations on the P.E.R. of the proteins of the malt foods and on the composition of the liver and blood of rats fed on the different malt foods is in progress.

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