

THE CHEMICAL COMPOSITION AND SHELF-LIFE OF A PROTEIN FOOD BASED ON A BLEND OF SOYABEAN, GROUNDNUT AND COCONUT FLOURS

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Studies on the utilization of available sources of vegetable proteins such as oil seed meals and pulses for making up the protein deficiency in the diets of children in several developing countries have been reported by several groups of workers¹⁻⁴. Previous studies at this Institute have shown that a multipurpose food based on a 3:1 blend of groundnut flour and Bengalgram flour, possesses a high nutritive value and a significant supplementary value to poor quality vegetarian diets, as assessed by animal experiments and feeding trials on school children⁵⁻⁷. The proteins of the food, however, have a lower protein efficiency ratio than milk proteins⁸. This is mainly due to the fact that the proteins of groundnut are partially deficient in lysine, methionine and threonine, while those of Bengalgram are deficient in methionine and tryptophan⁹. It was therefore considered desirable to prepare a blend based on vegetable protein foods available in most of the developing countries, containing proteins of higher nutritive value than Indian multipurpose food. The present paper relates

to studies on the chemical composition and shelf-life of a protein food based on a blend of soya bean, groundnut and coconut flours and fortified with calcium salts and essential vitamins.

Experimental

Materials: Decorticated soyabean dhal was processed according to Krishnamurthy *et al*¹⁰ to destroy the tryptic inhibitor and was debittered by treatment with sodium bicarbonate according to Desikachar *et al*¹¹. The processed dhal was dried at 50-55°C in a cabinet drier and powdered in a hammer mill to pass through 50 mesh. Low-fat groundnut flour was prepared from good quality groundnut kernels according to Subrahmanyam *et al*¹².

Edible quality coconut cake used in this study was obtained from Messrs Tata Oil Mills, Ernakulam. The material was powdered in a hammer mill to pass through a 40 mesh sieve and roasted lightly at a temperature of 90°C for about 5 minutes to develop a pleasant aroma.

Seasoning premix was prepared by mixing

coriander seeds (60 parts), black pepper (30 parts), turmeric (9 parts) and asafoetida (1 part) which was then slightly roasted with a small quantity of hydrogenated fat and powdered.

The protein food was prepared in two forms, unseasoned and seasoned. The unseasoned product consisted of a blend of full-fat soya flour (40 parts), groundnut flour (30 parts) and coconut meal (30 parts) fortified with vitamins A and D, thiamine and riboflavin and calcium as calcium phosphate and carbonate. It was flavoured with vanillin. The seasoned product was prepared by adding the seasoning premix at 3 per cent level and common salt at 3 per cent level to the unseasoned product prepared as above, but without addition of vanillin.

The chemical composition of the protein food as compared with that of skim milk powder determined according to A.O.A.C. methods¹³ is given in Table I.

The protein food was packed in polythene bags which were sealed in cans and stored at 37°C for a period of 9 months. Control samples were kept at 0°C. Samples stored at 37°C were analysed once in three months for free fatty acids, peroxide value, vitamin A and thiamine. Free fatty acids and peroxide value were determined according to Krishnamurthy *et al*¹⁴ and vitamin A and thiamine contents according to A.O.A.C. methods¹³. The organoleptic quality of the protein food was tested by a panel of 6 judges selected from among the Institute staff members. The score system adopted was

TABLE I. Chemical composition of protein food based on a blend of groundnut flour, coconut meal and full-fat soya bean flour fortified with vitamins and calcium salts

(Values per 100g)

Constituents	Protein food ¹	Skim milk powder
Moisture (g) ...	6.2	3.8
Protein (N × 6.25) (g) ...	41.7	35.6
Fat (g) ...	12.6	0.1
Calcium (g) ...	0.98	1.32
Phosphorus (g) ...	0.75	1.05
Iron (mg) ...	6.5	0.5
Thiamine (mg) ...	2.12	0.56
Riboflavin (mg) ...	3.29	1.52
Nicotinic acid (mg) ...	9.36	1.1
Vitamin A (i.u.)*	3,000	...
Vitamin D (i.u.)*	300	...

¹ Fortified with vitamins A and D, thiamine, riboflavin and calcium phosphate and carbonate.

* Added values.

similar to that of Chandrasekhara *et al*¹⁵. A product having a score of 2 or less was considered acceptable. The results are given in Table II.

Results and Discussion

The results given in Table I show that the protein food contains larger amounts of proteins and vitamins A and D, thiamine and riboflavin than skim milk powder. A daily supplement of 40-50 g. of the protein food will provide about half the daily requirements of proteins, vitamins and minerals of children.¹⁶ Table II shows that both the seasoned and unseasoned foods keep well for a period of 9 months at 37°C in hermetically sealed containers. The losses of vitamin

TABLE II. Shelf-life of protein food fortified with vitamins and minerals

Constituents	Initial		3 months		6 months		9 months	
	S	US	S	US	S	US	S	US
Free fatty acids ¹ (as% oleic acid) ...	1.5	1.4	2.9	3.8	4.6	6.5	6.8	8.2
Peroxide value ²	3.4	5.6	5.8	8.4	7.4	12.5
Vitamin A (i.u.) ...	2970	2980	2680	2620	2430	2390	2320	2250
Thiamine (mg) ...	2.00	2.12	1.85	1.89	1.79	1.76	1.70	1.72

¹ Expressed on fat basis.

² Millimols of thio per g of fat.

S: Seasoned.

US: Unseasoned.

A and thiamine in the protein foods during the period were 21.8–24.5 per cent and 15.0–18.9 per cent respectively.

Summary

1. A protein food based on a 4:3:3 blend of full-fat soya flour, groundnut flour and coconut meal containing about 42 per cent protein and adequately fortified with calcium salts and vitamins A and D, thiamine and riboflavin has been prepared.

2. The protein food kept well at 37°C in hermetically sealed containers for a period of 9 months, the losses of vitamin A and thiamine in the seasoned and unseasoned protein foods during this period being 21.8–24.5 per cent and 15.0–18.9 per cent respectively.

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