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NUTRITIONAL PROPERTIES OF SESAME SEED PROTEIN CONCENTRATE PREPARED FROM COMMERCIAL SESAME SEED CAKE

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A protein concentrate containing 72% protein was prepared from commercial sesame seed cake. When supplemented with fish protein concentrate or skim milk powder so that equal quantity of proteins were derived from either sources, the net protein utilization and protein efficiency ratio were improved almost approaching to the level of animal protein used.

In an earlier communication[1] preparation of sesame flour from indigenous cake has been described. It was also indicated that unless efforts are made to produce it under controlled conditions so as to eliminate dust and dirt the production of edible grade sesame flour will remain a remote possibility.

With a view to find an immediate use of the commercial sesame seed cake it was considered desirable to process it in the form of rich concentrate and at the same time eliminate the deleterious materials which hamper its use as direct human food. In earlier communications[2,3] preparation of cottonseed protein concentrate and rapeseed protein concentrate from commercial cakes has been described. Following the same technique a concentrate containing 72% protein (N% × 6.25) was prepared from sesame seed cake. As the N. P. U. of the sesame seed protein concentrate is low (42.5), attempts were made to improve the N.P.U. by supplementation with animal protein concentrates, the results of which are presented in this paper.

Experimental

Preparation of Sesame Seed Protein Concentrate (SSPC).—Sesame seed cake (100 g), black variety, obtained locally was finely ground to 80 mesh and defatted by petroleum ether (b.p. 60–65°C) in a soxhlet apparatus. The residual solvent was removed by drying the flour in air oven at 60°C. The sesame flour thus prepared contained 42.5% protein (N% × 6.25) as determined by the Kjeldahl method.

The flour was then treated with N/10 sodium hydroxide (1:8) keeping the pH at *ca.* 10. The slurry was stirred at room temperature for 4 hr. The alkaline extract was separated by centrifuging. About 500 ml water was added to the residue and pH was adjusted by adding N/10 sodium hydroxide. The mixture was stirred again for 3 hr and the extract separated by centrifuging. The extracts were combined and the proteins were precipitated by acidifying the extract to pH 4.5. The proteins were separated by centrifuging, and repeatedly washed with water to remove salts and acidity and finally dried in an air oven at 50°C. The dried residue was ground to a fine powder. By this method the loss of protein in the water phase is only 5.8%.

Determination of Net Protein Utilization (N.P.U.) Value.—Sesame seed protein concentrate was mixed with FPC, prepared as described earlier,[4] and skim milk powder (foreign brand purchased locally) in such a manner that there was equal contribution of protein from either of the protein sources and that the total protein content in the semisynthetic diets used for animal feeding was *ca.* 10%. The above combination of vegetable and animal proteins had

TABLE 1.—VARIOUS CONCENTRATES AND MAIZE STARCH USED FOR 1 kg OF EXPERIMENTAL DIETS*.

Protein source	Protein contribution %	Sesame seed protein concentrate g	Fish flour g	Skim milk g	Maize g
Sesame seed protein concentrate	10	139	—	—	361
Fish protein concentrate	10	—	126.6	—	373.4
Skim milk powder	10	—	—	284	214
Sesame seed protein concentrate +Fish protein concentrate	5 +5	70	63.3	—	366.7
Sesame seed protein concentrate +Skim milk powder	5 +5	70	—	143	287

*The diet also contained; hydrogenated fat 150 g; glucose 150g; potato starch 100g; vitamins 50 g; mineral mixtures 50 g.

shown maximum supplementary effect in earlier[4] studies with cottonseed protein concentrate. The composition of various diets is shown in Table 1.

The N.P.U. of the diets were determined as described earlier,[5] and converted to N.P.U.$_{st}$ by calculation.[6] The result of N.P.U. determinations are shown in Table 2.

Determination of Protein Efficiency Ratio (P.E.R.).—P.E.R. of sesame seed protein concentrate and its various blends were determined according to the method described earlier[3] using male albino rats weighing 30–35 g. The results are shown in Table 3.

TABLE 2.—NET PROTEIN UTILIZATION (N.P.U.) OF EXPERIMENTAL DIETS*.

Protein source	Protein cal %	N.P.U.% at 10 % protein level	N.P.U. $_{st}$%
Sesame seed protein concentrate	10.1	40.5	42.0
Fish protein concentrate	10.0	86.9	98.7
Skim milk powder	10.0	75.5	84.7
Sesame seed protein concentrate +Fish protein concentrate	10.1	78.0	90.0
Sesame seed protein isolate +skim milk powder	9.8	70.5	78.1

*For composition of various diets, see Table 1.

TABLE 3.—PROTEIN EFFICIENCY RATIO (P.E.R.) OF THE EXPERIMENTAL DIET

(Experimental period 4 weeks, 8 rats per group)

Source of protein	Protein in diets on dry basis	Dried food intake g	Protein intake g	Wt gain g	P.E.R.
Sesame seed protein concentrate ..	10.75	125	13.4	16.0	1.2
Fish protein concentrate	10.75	130	14.0	46.0	3.3
Skim milk	11.50	160	18.5	57.5	3.1
Sesame seed protein concentrate+Fish protein concentrate	10.56	174	18.3	51.5	2.8
Sesame seed protein concentrates +Skim Milk	9.13	180	16.3	43.0	2.6

Discussion

Protein concentrates and isolates from oil cakes have received much attention recently. They possess a bland taste and are free from deleterious material which are generally associated with the parent raw material. They can therefore readily be used in formula diets for infants and other vulnerable groups.

The sesame seed protein concentrate prepared from commercial sesame seed cake contained 72% protein which was almost twice that contained in the original cake. The N.P.U. of the concentrate was found to be almost the same as that of the original flour which indicated that no perceptible damage to proteins occurred during the course of processing. It possessed a bland taste and was free from undesirable constituents. The only drawback was its low protein value which, however, could be improved by supplementation with either fish protein concentrate or skim milk powder. The N.P.U.$_{st}$ of sesame seed protein concentrate which was 42.0 was improved to 90.0 by supplementation with FPC and to 78.1 by supplementation with skim milk powder.

Similar results were obtained by determining the P.E.R. of the same experimental diets. By supplementation with FPC, the P.E.R. of concentrate improved from 1.2 to 3.1 which are almost the same as that FPC used (Table 3). Similar improvement was effected by supplementation of the concentrate with skim milk powder.

The above results indicate the possibility of replacing expensive animal protein concentrates partially with sesame seed protein concentrate without any significant loss in the efficiency of calories and protein utilization in the body.

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