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Nutrition Laboratory, National Research Centre, Dokki, Cairo (Egypt)

Improvement of Supramine and development of new food mixtures for the young
II. Development of new food mixtures for the young

F. A. El-Shobaki and *S. M. Hegazi*

With 4 tables

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It is now accepted that in localities where milk and other products of animal origin are too scarce and expensive, food combinations of locally available protein-rich legumes and cereals are successful to supply the essential nutrients that satisfy the physiological requirements of children (1–5). In our previous work (6) trials were made to improve the palatability and quality of a locally produced food mixture "Supramine" produced by El-Nil Pharmaceutical Company and supported by the UNICEF.

To ensure success for any product in the market, studies must be done from time to time to evaluate the economic aspects of production concerning the availability and costs of the ingredients used for formulation. Besides, changing the taste of the product or producing more than one product with different tastes to suit different consumers is favourable.

There are many other food items of plant origin which are familiar to the Egyptians, being palatable to our population and highly nutritious. Examples of these are: soybean, rice, peanut, semolina, and parboiled wheat. In the present work, trials are made to formulate new food mixtures composed of some of the ingredients used in Supramine together with other ingredients mentioned above.

Material and methods

The material used in formulation of these food mixtures are some cereals and legumes which are familiar in the local market and which are known to be popular to the Egyptians. These are chickpea, rice, soybean, wheat, peanut, and semolina in addition to skimmed milk and sugar.

Preparation of these mixtures was made taking into consideration that the final product contains a round figure of 20 % g protein. In addition, deficiency in one or more of the amino acids in one ingredient is substituted by another rich in that amino acid. Besides, the ingredients used were heated before mixing to improve palatability and digestibility of the final product and to get rid of toxic factors possibly present in some of these ingredients.

Table 1. Composition of the prepared food mixtures expressed in grams/100 g mixture.

Mixt. No.	Chick-pea	Rice	Soybean	Wheat flour	Roasted peanut	Semolina	Skimmed milk	Sugar	Vitamins
1	15	55	10	–	–	–	10	9	1
2	15	30	15	20	–	–	10	9	1
3	15	20	–	30	15	–	10	9	1
4	–	25	15	–	–	35	15	9	1

Four food mixtures could be prepared, the composition of which is shown in table 1. These mixtures were prepared as follows:

Mixt. 1: Prepared by mixing in 1 kg mixture, 150 g autoclaved chickpea, 550 g parboiled rice, 100 g fat-free soybean, 100 g skimmed milk, 90 g sugar, and 10 g vitamin mixture.

Mixt. 2: Composed of 150 g autoclaved chickpea, 300 g parboiled rice, 150 g fat-free soybean, 200 g wheat flour together with skimmed milk, sugar, and vitamins in the same proportion as mixt. 1.

Mixt. 3: Composed of 150 g autoclaved chickpea, 200 g parboiled rice, 300 g wheat flour, 150 g roasted peanut and the same proportion of skimmed milk, sugar, and vitamins as mixt. 1 and 2.

Mixt. 4: Composed of 250 g rice, 150 g fat-free soybean, 350 g semolina, 150 g skimmed milk, 90 g sugar, and 10 g vitamins.

Preparation of ingredients

Chickpea: 1 kg of raw chickpea was added with 500 ml water, autoclaved at 100 °C for ½ hour, dried in air-circulating oven at 70 °C then ground into fine powder.

Rice: Parboiled in water (1000–500 ml), then dried and ground as mentioned before.

Soybean: Extracted with ether to remove fat content, autoclaved at 100 °C for ½ hour, dried and ground as previously mentioned.

Peanut: Obtained roasted from the local market, defatted and powdered.

The ingredients forming a certain mixture were mixed together in the designed proportion and the final product was again ground into fine powder to ensure good mixing.

The following analysis were made to each of the prepared food mixture: Moisture, protein, fat, and ash were determined according to the O.A.A.C. (7), total carbohydrates were determined by difference. The mineral content (Fe, Zn, Cu & P) of these mixtures was estimated in ash by the Atomic Absorption Spectrophotometry (Model Zeiss PM6). Amino acid pattern was done according to the method of *Levy* and *Chang* (8).

Table 2. Chemical composition of formulated food mixtures.

Mixt. No.	Moisture	Protein	Fat	Crude fibre	Ash	Total hydrolysable carbohydrates
1	9.2	17.2	1.38	1.21	2.1	68.9
2	8.7	18.2	1.73	1.56	3.5	66.4
3	8.5	20.3	1.79	1.24	2.5	65.7
4	8.8	18.9	1.45	1.05	3.3	67.9

Table 3. Mineral content of the prepared food mixtures*).

Mixt. No.	Phosphorus	Iron	Copper	Zinc
1	145	10.2	0.46	1.49
2	196	9.1	0.87	2.70
3	314	5.0	0.80	2.30
4	267	4.5	0.67	2.40

*) Calculated as mg/100 g mixture.

Table 4. Amino acid composition of the prepared food mixtures (mg/g N).

Amino acid	Mixt. No. 1	Mixt. No. 2	Mixt. No. 3	Mixt. No. 4
Aspartic acid	743	703	535	630
Glutamic acid	982	1055	833	1180
Glycine	298	314	259	363
Serine	292	297	238	297
Threonine	277	290	248	314
Alanine	270	269	220	264
Tyrosine	305	290	287	396
Valine	291	276	287	380
Phenylalanine	349	331	270	353
Leucine + Isoleucine	764	667	575	700
Lysine	295	317	275	396
Arginine	314	340	327	281
Histidine	226	259	230	277
Methionine	120	112	80	120
Cystine	77	93	78	88
Tryptophan	177	152	141	160

Results

The chemical composition of the prepared food mixtures is shown in table 2. The mineral content including Fe, Cu, Zn and P is given in table 3. The amino acid pattern is represented in table 4.

Discussion

During our trials to improve the palatability of "Supramine" we found that the presence of lentils in the mixture causes some of the unpalatable taste in that food. The heat treatment made to lentils before mixing minimized this taste. However, in order to avoid that taste, lentils were excluded from these newly-formulated food mixtures. Rice is a popular dish liked by many of the population in Egypt. It is familiar that mothers usually give rice water to their children as supplementary food to breast feeding, and the children usually accept this with satisfaction. In addition to this advantage, the nutritional value of rice protein was proven to be greater than that of wheat protein as evidenced by *Kiku Murata* et al. (9). In addition, increasing the concentration of dietary protein from rice increased the weight of the spleen and the number of antibody-forming cells (10). In our mixtures, rice formed a good proportion of the formula ranging from 20 to 55 %.

Soybean has been widely used for formulation of baby foods due to its high protein content and relatively low cost (11, 12, 13). Soybean was also used as one of the ingredients in our prepared mixtures, but in relatively low percentage to avoid the effect of toxic factors possibly present in soybeans. To realize better taste to the products roasted, peanut or semolina were each added in certain proportions as one of the ingredients of the mixture. Analysis of these mixture showed a protein content ranging from 17.2 to 20.3 %, which is a good ratio of protein, enough to satisfy

the daily requirement of a child up to 10 kg of body weight, if he consumes 100 g of the mixture.

As shown in the table, most of the amino acids, particularly the essential ones, are present in the prepared mixtures in appropriate concentration compared with the FAO provisional pattern expressed as mg/g N. Only cystine and methionine are partially deficient in our formulae. Supplementation of these mixtures with methionine is suggested to overcome deficiency of sulphur amino acids.

Mineral analysis of the prepared mixtures revealed that they are relatively deficient in both zinc and phosphorus. Iron is adequate with regard to quantity, but whether this iron is bioavailable or not need further investigations, which is planned to be done in the near future. We think that it is valuable to enrich these mixtures with essential elements as iron, zinc, calcium, and phosphorus, which are necessary for normal growth and performance of metabolic functions.

Preliminary panel test carried out on staff members of the department proved that these mixtures are palatable and acceptable. Further investigations are carried out on these mixtures to evaluate the biological value and economicity of these mixtures to prepare them afterwards in an industrial scale.

Summary

Four high-protein food mixtures for feeding the young were formulated from locally available and relatively cheap legumes and cereals. Protein content of these mixtures ranged from 17.2 to 20.3 g %. Amino acid composition showed agreement with the FAO provisional pattern except for sulphur amino acids. Analysis of the mineral content of the prepared mixtures indicated the necessity of supplementation with zinc and phosphorus to meet the physiological requirements of the consumers.

Palatability studies showed that these mixtures are acceptable and with good taste. It is planned to produce these mixtures on an industrial scale after biological and economic evaluation.

References

1. *Hassan, Ali, S. R. Morcos, Sorya El-Zamzami:* Gaz. Egypt. Ped. Assoc. **8,** 487 (1960). – 2. *Panemangalore, M., Joseph M. Kantha, Rao, Narayana, N. Subramanian, K. Indinamma, D. S. Bhatia, M. Swaminathan, A. Sreenivasan, V. Subramanian:* J. Food Sci. **11,** 199 (1962). – 3. *Tannous, R. I., J. W. Cowan, F. Rinnu, R. J. Asfour, Z. I. Sabry:* Am. J. Clin. Nutr. **17,** 143 (1965). – 4. *Lateefa Knan:* J. Nutr. and Dietet. **6,** 234 (1969). – 5. *Bender, A. E.:* Royal Society of Health Journal, **89,** 221 (1969). – 6. *Hegazi, S. M., F. A. El-Shobaki:* 1980 Under Publication. – 7. Official Methods of Analysis of the Association of the Official Analytical Chemists, 12th Edition 1975. – 8. *Levy, A. L., D. Chang:* Annal. Chem. **25,** 396 (1953). – 9. *Kiku Murata, Y. Tanaka, Y. Kawaguchi:* 1973, **7,** 2, 93 (1973). – 10. *Felicitas Piedad-Paseual, Lotte Arnrich, Mary Alice Kenny:* J. Nutr. **100,** 389 (1970). – 11. *Dean, R. F. A.:* Med. Res. Council Spl. Rep. Ser. 279, H.M. Stationary Office (London 1953). – 12. FAO Nutrition Meeting Series No. 22 "Report of the FAO/UNICEF Regional School Feeding Seminar for Asia and the Far East". Food and Agriculture organization of the United Nations, Rome. 48 (1958). – 13. *Subramanian, V., M. R. Chandrasekhara, N. Subramanian, D. S. Soma Korula, A. Bhatia, A. Sreenivasan, M. Swaminathan:* J. Food Sci. **11,** 9 (1962).

Authors' address:

Dr. *F. A. El-Shobaki,* Nutrition Laboratory, National Research Centre, Dokki, Cairo (Egypt)