

The Effectiveness of Protein of Bread Sesame Mixture in Supporting Growth in Rats

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ABSTRACT

The practical application of using bread and sesame mixtures in human feeding is evaluated by studying the growth rate of a group of two months old rats maintained on three test diets. All three diets contained 47% carbohydrate, 10% lipid, and 8.4% protein and were supplemented with vitamins, salts and bulk. The source of protein in diet I was 1:2.3 mixture of sesame seed and bread, in diet II bread and in diet III casine. Rats on diet I grew more than twice as fast as those on diet II, but not as well as those on diet III. The results were statistically highly significant.

Plant proteins from a single source poorly support animal growth as compared to animal proteins. This is because plant proteins are usually low in their content of one or more essential amino acids. Mixtures made up of two or more plant proteins are known to effectively support growth by complementing each other's deficiency in the essential amino acids. Such mixtures form the backbone of the scientific diet of farm animals.

Many attempts have been made to produce plant mixtures with good amino acid composition suitable for human consumption. Although many of these attempts lead to nutritionally excellent mixtures, they were rarely acceptable to the consumer on a large scale^{1,2}. In the Middle East bread, made of wheat is the main source of protein for a large segment of the population and sesame is a common additive to bread. The aim of the present study is to assess the effectiveness of the wheat sesame mixture in supporting animal growth.

METHODS

A. The Experimental Animals: A total of eighteen (9 males and 9 females) rats of CDF Fischer

strain aged two months were used and were bred at the Animal House, College of Medicine and Medical Sciences, Arabian Gulf University. They were kept every three in a cage with the sexes segregated. The animals were weighed every other day for two weeks. The growth rates of the rats, and linear regression and correlation coefficient were calculated according to the least square method for each rat. They were shifted from the regular laboratory animal food to the prepared mixture diets two days prior to the start of the experiment.

B. The Diet Mixture: Bread, sesame seeds, corn oil and corn starch were purchased from the local market. The vitamin tablets and the fibre were human pharmaceutical products. Vitamin free casine was purchased from Fluka, Switzerland. Agar was purchased from DIFCO Co. Salt mixtures were also added as shown below.

The rats were divided into three groups and each group was given a special mixture of diet as

TABLE 1

Formulation of the Diets
Composition GM

	I	II	III
Bread	395	655	—
Sesame	173	—	—
Oil	—	96	103
Starch	173	—	471
Casine	—	—	86
Water	234	218	291
Agar, Fibre, Salt, Vit*	30	30	50

* expressed in gm/day/rat

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shown in Table 1. There were animals (3 males and 3 females) in each group. The test diets were blended in a waring blender so that each diet was to contain equal amounts of protein, carbohydrate and fat and excess of the vitamins and salts. More vitamin and bulk in the form of fibres were added to the synthetic casine diet III.

These mixtures were supplemented by a salt mixture to provide Na, Cl, Mg, Ca, P₀₄, S₀₄. Trace elements were not included in this short term experiment. Each kilogram of mixture was supplemented by 1.5 gm of fibre for mixtures I and II and 3 gm for mixture III which contained less natural fibre.

Each kilogram was supplemented by 15 mg of Thiamine Hcl, 10mg Riboflavin, 5mg Pyndoxine Hcl, 50mg Nicotinamide, 18mg Ca Pantothehte, 45mg Tocopheylacetate, 450mg Insitol, 3mg Biotin, 4mg Folic Acid, 15,000 IU vitamin A, 3,000 IU Vitamin D3 and 10mg Vitamin K. The amount of vitamins was doubled for mixture III.

RESULTS

Table 2 shows the mean weight and standard errors for each of the groups. Very highly significant differences between any two groups were obtained ($P < 0.001$).

TABLE 2

Growth of rats on the different diets

Group	Protein Source	Growth rate* Mean + SE	Correlation Coeff.M + Se
1	Bread & Sesame	1.93 + 0.30	0.96 + 0.025
2	Bread	0.88 + 0.35	0.64 + 0.18
3	Casine	3.05 + 0.30	0.94 + 0.049

The growth rates on the bread and sesame mixture are more than twice the growth rate on bread alone, but not as good as on casine.

It is worth noting that the correlation coefficient

of growth vs time for the individual animals was consistently excellent for groups I and III and not so good for group II. This could simply be due to the poor mean growth rates in group II, while the variations remained constant.

DISCUSSION

In this study we attempted to measure the growth of young rats fed on a mixture of sesame and bread as compared to those fed on bread alone. The first two groups in this study received plant protein only while the third received a synthetic diet containing animal protein in the form of casine, the major milk protein. In this context the third group can be regarded as a control group.

All these mixtures were designed to provide the same percentage of carbohydrate, fat, protein and bulk, and all were supplemented with salt and vitamin mixtures to ensure adequate supplies of other nutrients. The protein content of these diets were left close to the minimum so as to simulate the diet of the underdeveloped countries.

Our results indicate that the growth rate of rats maintained on bread sesame mixture, where 60% of the protein is provided by the bread, is better than those maintained on bread alone. Theoretically, these mixtures provided a better supplement of lysine and methionine and this explains its effectiveness³.

All three diets provided 47gm of carbohydrates, 10gms of fat and 8.4gm of protein per 100gm of diet³. Protein thus provided 11% of the calories of the diets. This is a low figure as compared to the value of diets in the underdeveloped countries. This would mean that adding sesame to the bread as a supplement would increase its nutritional value. Recommendations for the adoption of bread sesame mixtures in feeding may not prove to be too difficult to perform since from an agricultural point of view, the bread-sesame mixture makes good sense as sesame is often planted in the same fields as a summer crop after the harvesting of wheat.

Bread and sesame mixtures are accepted diet in the Middle East in the form of sesame covered bread, cake and Barazik, Sesame in the form of

Tahini is also often consumed with bread in the form of Halawi (Rahash) and other Tahini mixtures.

CONCLUSION

Diet containing mixtures of plant proteins such as sesame and bread can replace meat and any other source of animal protein by providing adequate supply of essential amino acids. Sesame is a cheap plant and can be used in a variety of food mixtures. The study however need to be verified using a control group that must receive laboratory diet only. It would also be useful to corroborate our results by Nitrogen balance experiments on human volunteers.

REFERENCES

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3. Food and Agricultural Organization of the United Nations. Food Composition Tables for the Near East, Rome: 1982.

TABLE 1

Growth of rats on the different diets

Group	Protein Source	Growth rate (g/day)
1	Bread & Sesame	1.73 ± 0.36 0.96 ± 0.017
2	Bread	0.88 ± 0.33 0.64 ± 0.18
3	Casein	2.05 ± 0.30 0.94 ± 0.049

The growth rates on the bread and sesame mixture are more than twice the growth rate of bread alone, but not as good as in casein. It is worth noting that the growth rate of the rats